Structural Change and Economic Development: An Analysis for Lesotho

by

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Biographic note

Mpolelo Lydia Letsoela was born and bred in Maseru, Lesotho, and obtained her BA in Economics and Statistics from the National University of Lesotho in 2013. In the same year, she co-authored a paper that was later published in the African Review of Economics and Finance journal. She then worked for Médecins Sans Frontières before receiving the Erasmus Mundus DREAM Scholarship, joining FEP in the academic year 2015/2016. Besides her academic aspirations of becoming a fully-fledged economist and researcher, she is passionate about development, spirituality and people. She dedicated a great deal of her time to charitable causes through the Rotary International.

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Abstract

The high dependence of labour in the agricultural sector in most low to medium-low income countries such as Lesotho indicates an untapped potential for structural change. Although many studies have analysed the causal mechanisms between structural change and growth, there is still a paucity of empirical evidence regarding the factors that influence this transformation in the African context. We contribute to the literature by identifying the key determinants of structural change in low and middle income countries in Africa. The analysis begins with a characterization of the structural change patterns in Lesotho from 1990-2015. Next we use a static shift-share analysis to describe the contribution of structural change on labour productivity growth in Lesotho between 1999 and 2008. Our results give evidence for a growth enhancing structural change, where labour is shifting from agriculture to higher productivity industries. Lastly, to identify the determinants of structural change, we employ the fixed-effects and random-effects regression models for a cross-country analysis involving 21 SSA countries from 1992-2012. Using a dynamic form of the shift-share analysis to compute the dependent variable, we find strong evidence for the benefits of higher trade openness and increased investments. The study further reveals a detrimental effect associated with the growth of natural resource rents.

JEL codes: O14, O47, C33

Keywords: Structural Change, Labour Productivity Growth, Shift-Share Analysis, Sub-Saharan Africa

Resumo

A elevada importância do sector agrícola na maioria dos países de baixo e médio-baixo rendimento como o Lesoto indica um potencial de mudança estrutural. Embora existam muitos estudos que analisaam a relação causal entre mudança estrutural e crescimento, existe ainda uma escassez de estudos empíricos sobre os fatores que influenciam essa transformação estrutural no contexto africano. Este estudo pretende contribuir para a literatura ao identificar os principais determinantes da mudança estrutural em países africanos de rendimento baixo e médio-baixo. Após a caracterização dos padrões de mudança estrutural no Lesoto de 1990 a 2015, o estudo recorre à técnica *shift-share* estática para descrever a contribuição da mudança estrutural para o crescimento da produtividade do trabalho no Lesoto entre 1999 e 2008. Os resultados mostram que a mudança estrutural contribui para o crescimento no Lesotho, sendo significativa a transferência de trabalho da agricultura para a indústria. Tendo como objetivo a identificação dos determinantes da mudança estrutural, o estudo recorre ao modelo de regressão com efeitos fixos e efeitos aleatório e a uma amostra de 21 países do SSA para o período 1992-2012. Usando uma variante dinâmica da *shift-share* para calcular a variável dependente, encontram-se fortes evidências dos benefícios da maior abertura ao comércio internacional e do aumento do investimento. O estudo revela ainda um efeito prejudicial associado ao crescimento dos rendimentos gerados na exploração de recursos naturais.

Códigos-JEL: O14, O47, C33

Palavras-chave: Mudança Estrutural, Crescimento da Produtividade do Trabalho, Análise Shift-Share, África Subsariana

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Chapter 1. Introduction

The study of economic development, since its origin as an independent branch in economics, has placed considerable attention on the idea of economic convergence, a process through which low income countries catch up with higher income countries by growing faster. A much notable feature of economic development is the process of structural transformation - *"the reallocation of resources across the broad economic sectors of agriculture, manufacturing, and services"* (Herrendorf et al., 2013, p. 2752). The concept of structural change has played an important role in explaining development patterns of industrialized economies across different regions and time periods. In the famous work of Kuznets (1973), the author makes an allusion to structural change as one of the stylized facts of economic development.

One of the key features of structural change is portrayed in the decline of the share of agriculture in employment, a change mainly attributed to the 'labour pull' and 'labour push' theories of development (Alvarez-Cuadrado and Poschke, 2011). The pioneering work of Lewis (1954) explains the process through which technical progress in the modern sector attracts surplus labour from agriculture and transforms an initially traditional economy into an industrialized one. Alternatively, Rostow (1960) *cfr* Todaro and Smith (2011) identifies technical progress in agriculture as a pre-condition toward the next stages of development. Chenery (1960) also uncovers a significant and positive correlation in the relationship between the growth of per capita income and the share of industrial output.

While the quest for development is predominant across all African countries, development indicators in most of Sub-Saharan Africa (SSA) remain lower than the region average. Lesotho is not only part of this region, but is also one of the four smallest African countries,[1] by surface area, that are completely enclosed by land, and the only economy that is landlocked by a single country. As a result of this unusual geographical nature, Lesotho is more vulnerable to issues affecting landlocked developing countries, such as transit dependence and barriers to trade among others. On the other hand, Lesotho

[1] Other countries are Burundi, Rwanda and Swaziland.

is completely enclaved by South Africa, an emerging economy and a member of BRICS,[2] with which it has strong economic and developmental relations, including a Multilateral Monetary Area and free trade agreements.

The economy of Lesotho, like many other low and medium-low income countries, continues to experience structural transformations. Most notable is the steady decline in the share of agricultural output in GDP, which is mostly credited to the expansion of the textiles and apparel industries. The main driver of this expansion is the free access to the American market that Lesotho enjoys through the African Growth Opportunity Act (AGOA) (Nseera, 2014). The services sector also surged in recent time. The same transformations ring true for other small African countries like the Seychelles, Rwanda, Burundi and Mauritius, which have higher annual percentage growth of industrial, manufacturing and services sectors than Lesotho (World Development Indicators, 2016). In fact, despite the above mentioned developments, Lesotho's economy still endures many developmental problems. Over 50% of the population continues to live below the World Bank poverty line of US$1.25 a day, while inequalities and unemployment levels also remain very high (AfDB/OECD/UNDP, 2016). Furthermore, 62% of the labour force is engaged in activities of the primary sector, which is mostly subsistence in nature (Central Bank of Lesotho, 2009).

The main contribution of this dissertation lies in identifying the key determinants of structural change in low to medium-low income per capita countries. Particularly, it aims to answer the following questions: first, what is the role of structural change on labour productivity growth in Lesotho? Second, which are the factors that influence structural change in low and middle income countries in Africa? In order to answer our research questions we aim: (i) to characterise the patterns of structural transformation in Lesotho; (ii) to describe the role of structural change on the country's productivity levels; and iii) to identify the determinants of the structural change magnitude in the SSA region.

Considering the importance of the reallocation of labour in the development process, it is fundamentally important for low and middle-low income countries in SSA to identify factors that can enhance or distort the process. However, although a large body of the academic literature has emphasised the relationship between structural change and

[2] An association between the five newly industrialized developing economies of Brazil, Russia, India, China and South Africa (de Vries et. al, 2012).

other macroeconomic fundamentals, there are not many studies that have explored the factors that influence structural change within the African context. Our study aims to contribute to the existing literature in this regard. Furthermore, there are no studies of which we are aware of that have previously attempted to explain the role of structural change on labour productivity growth in Lesotho. In fact, the case of Lesotho is intriguing because this small country fell far behind other peer African countries with which it had a similar level of economic development (See Appendix A.1 that presents some historical data showing that the economies of other small landlocked countries like Swaziland and Rwanda have outperformed Lesotho).

In order to account for the contribution of structural change on labour productivity growth in Lesotho, the study employs the shift share methodology adapted from Fagerberg (2000) through which the change of an aggregate is broken into a structural component to reflect both the between (reallocation effect) and the within sector changes. In addition, panel data OLS regressions are also employed to explain the variation of the structural change magnitude across 21 SSA countries over the period 1992-2012.

The dissertation is organised as follows. Chapter 2 reviews the literature on some of the most important contributions on the topic of structural change and economic development. Subsequently, Chapter 3 looks into the empirical evidence on the relation between structural change and macroeconomic dynamics in Africa. In Chapter 4 we characterize the dimensions of structural change within the Lesotho economy, followed by an analysis of the role of structural change on productivity growth in the country. Chapter 5 assesses the determinants of structural change across the SSA region and, finally, Chapter 6 presents the main conclusions and future research paths.

Chapter 2. Literature review on structural change and economic development

2.1. The main concepts: structural change and economic development

After the end of World War II, the topic of development was thrust upon economists as the newly formed independent governments sought advice for the acceleration of their development. Consequently, the world witnessed a plethora of studies by scholars and the international community which was aimed at fast-tracking the development of poor countries (Meier, 2001). At the core of these studies was a strong emphasis on the rapid growth of gross domestic product (GDP) as a necessity for economic development (Basu, 2001). This was particularly owing to the increasing population growth, which drove the emphasis to be placed on the numerator – GDP, in order to guarantee an increase in income per capita as a measure of development and welfare (Meier, 2001). The recent literature has advocated for development as a more comprehensive process and shifted much of the emphasis away from monetary measures. Sen (1983) explains that, if at all the idea of income per capita or labour productivity matters for development, it is because of the associated benefits (of increased life expectancy, literacy rates, etc.) that are realised in the process. However, this does not oust the potential role of income in influencing development. Sen (2001) further ascertains that, industrialization and growing incomes can be very important as a means of expanding the freedoms (i.e., capabilities) that are valued by society.

Todaro and Smith (2011) define economic development as a multidimensional process with the primary concern of attaining better standards of living. In addition, Sen (2001) extends this explanation and defines development as the process of removing the major sources of "unfreedom" that society bares. These include poverty, poor economic opportunities, and the lack of public facilities and social care, among others. According to McMillan et al. (2014), countries that manage to eradicate the incidence of poverty and to attain higher development levels, are those that manage to diversify their productivity away from agriculture to the modern sector. In relation to Silva and Teixeira (2008), classical economists from as far back as the 1700s have suggested a link between the process of economic development and changes in the pattern of economic structures. As a result, the study of how production factors can be used to facilitate transformation has

been a prevalent issue even before the launch of development economics as an autonomous field.

Structural change, as defined by Herrendorf et al. (2013), refers to the process of reallocation in the production of goods and services across the sectors of the economy. Matsuyama (2008) gives a more encompassing meaning and suggests that structural change entails a complementarity of changes from demographics to political institutions to the society's value system. As such, structural change can be viewed as a series of processes that a country experiences on the way to development (Chenery and Syrquin, 1975) and, at the very heart of the structural change literature, is the movement of labour from traditional low productivity activities to the more productive economic activities of the modern sector.

Smith (1763, 1776) *cfr*. Silva and Teixeira (2008) makes an important contribution to the literature through his recognition of the importance of labour specialization, where the division of labour and a switch from one sector to another is identified as the main vehicle for structural change. While it becomes clear that the phenomenon of structural change has long been addressed in economics, it was only in the twentieth century, when adequate data became available and structural change theories were tested, that the concept was consolidated. At the forefront of these developments were works by Arthur Lewis, Hollis Chenery and Simon Kuznets among others (Silva and Teixeira, 2008).

2.2. Structural change seminal theories

Lewis (1954) describes a basic model consisting of two economic sectors: the capitalist sector and the subsistence sector. The capitalist sector is defined as the part of the economy which employs the use of "reproducible" capital in production and can involve industries such as manufacturing, agricultural plantations, and mineral extractions. The subsistence sector on the other hand is said to be labour intensive and without the use of reproducible capital. An important characterization of this sector lies in the unlimited supply of labour, a variable factor which is used against a fixed resource (land) in the process of production. As the law of variable factor proportions states, increasing one factor while fixing another will lead to a decline in the marginal productivity of the variable factor. As a result, since labour is assumed to be unlimited in

this sector the marginal productivity of labour becomes negligible or reduces to zero. This leads to the phenomenon of "disguised unemployment" at the level of labour from which marginal product is zero (Todaro and Smith, 2011). Furthermore, the wages in this sector are also low and are indexed as a ratio of total production to the number of workers (Todaro and Smith, 2011). Nurkse (1953) also highlights the existence of a labour surplus in the traditional sector (disguised unemployment), which also represents a disguised saving potential, as the consumption of the labour surplus can be converted into effective saving by transferring the labour surplus into the modern sector.

The Lewis model focuses on the transmission of labour from the agrarian sector to the modern sector, a process which occurs without a loss of output in the subsistence sector due to the surplus of unproductive labour. These workers are drawn to the highly productive modern sector offering fixed wages at a level higher than the subsistence sector by a given premium. As the output of the modern sector grows, Lewis assumes that all of the capitalist profits are reinvested back into the sector, thus allowing for capital accumulation and an increase in the demand for labour. The rate of labour transfer from subsistence to the capitalist sector then happens at a rate equal to the accumulation of capital in this sector, and the process of a self-sustaining growth occurs until all the surplus labour has been absorbed. It is at this juncture - termed the "Lewis turning point" - that the withdrawal of labour from the subsistence sector can no longer occur without a decline in agricultural production. Thereby, the modern sector will have grown together with the sectorial transformation of the economy from a traditional to a more industrialized one (Todaro and Smith, 2011).

Another important contribution on the theory of structural change is Chenery (1960), where the author shows that the concept of structural change is not limited to the two sectors of the economy as the Lewis dual sector model may suggest. Chenery associates structural change with shifts in the composition of consumer demand (from food and other basic goods to more durable ones), changes in international trade and other socioeconomic factors like urbanization and population growth. According to the author, an increase in the income per capita of a country is correlated with a rise in the share of industrial output and this relationship is explained by Engel's law (the demand effect). In an attempt to search for additional explanations for this relationship, the paper examines closely not only the changes in demand but also the changes in supply as income levels

increase. The author makes mention of two important factors (in relation to the supply effect): an increase in the overall level of capital stock per worker and an increase in education and skills.

Kuznets (1973) was among the first to document some stylized facts about the historical evidence on modern growth and economic development. This analysis lead to the emergence of six characteristics of modern economic growth, falling distinctively within categories relating to aggregate growth, structural transformation and international spread. According to the author, the main features of structural change observed within the developed economies involved a number of factors: a reallocation of resources from the agricultural sector to industrial to the services sector; an increase in the scale of productive units associated with a related shift away from a personal enterprise to an impersonal organization of economic firms; a corresponding change in the occupational status of labour, which was followed by a shift in the consumption patterns together with the relative importance of domestic and foreign supply. Another important aspect was the process of modernization, which involved urbanization and a change in society and its beliefs.

Furthermore, while the Lewis model emphasizes the role of labour in the process of structural transformation, Kuznets elects technological advancement as the driving source of economic growth. However, the author also brings attention to the fact that, technological progress on its own is only a necessary condition and not sufficient for modern growth. Furthermore, if technology is to be employed in an efficient manner, institutional and ideological adaptations are required in order to have an influence on the proper utilization of innovations that come about as a result of human capital growth. To provide some examples from the epoch of modern growth Kuznets further mentions that: *"steam and electric power and the large-scale plants needed to exploit them are not compatible with family enterprise, illiteracy, or slavery; all of which prevailed in earlier times over much of even the developed world, and had to be replaced by more appropriate institutions and social views. Nor is modern technology compatible with the rural mode of life, the large and extended family pattern, and veneration of undisturbed nature"* (Kuznets, 1973, p. 247).

According to Todaro and Smith (2011), one of the most important contributions on structural change is provided by Chenery and Syrquin (1975), who build on the work

of Kuznets to present a number of interrelated changes within an economy, which are related to the growth of income per capita (or any other development index). According to the authors, the identification of structural change causes is a rather complex process and this is because of the interaction between demand and supply factors. Moreover, each feature of a country's development pattern can be explained by three components: (1) universal factors relating to the level of income, (2) general factors such as the size of the market and resource endowments of which the government may have little to no control over, and (3) political and social objectives together with the policies that have been adopted to achieve them. The main contribution of this study lies in separating universal factors from the specific country characteristics, and this is done by establishing testable links between the empirics and theory, and by analysing ten basic processes relating to capital accumulation, resource allocation as well as the demographic and distributional processes. Common characteristics that were found included, in presently developed countries, a period of deceleration (and even reversals in the direction of change in some cases) in almost all of the variables, while for the less developed countries, little structural changes in an earlier period were found to be followed by a period of acceleration in the rate of change for countries that had experienced substantial growth within the past fifty years.

2.3. Recent contributions to the study of structural change

Intra-sectoral changes

While some of the historical contributions on the literature were characterised by the discussion of between-sector differences (e.g. dual sector models), more recent contributions have been based on one specific aspect of structural change: the shift from old industries to new ones within the same sector. Matsuyama (2002) develops a model that aims to better understand the mechanisms relating to the stage of mass consumption within societies and to recognize necessary conditions for the success of such transformation. This is achieved by focusing on how productivity gains within one sector, manufacturing, affects growth from one industry to the other. According to the author, the causal relationship between productivity improvement and the rise of mass consumption is bidirectional. Improvements in productivity lead to a fall in the prices of goods, providing access to an increasing number of households as the goods become more

affordable, which in turn creates a larger market and further induces productivity gains. An important characteristic of this development process is the idea that productivity improvements in one industry will not only bring about an expansion in the individual industry, but rather that all other industries within manufacturing will also take off one after the other - making reference to the "Flying Geese" pattern of development.

Foellmi and Zweimüller (2008) have focused on the demand side explanation of structural change and study hierarchical preferences of households in an endogenous growth model. The analysis is based upon the view that the consumption patterns of households change along a hierarchy of needs and this leads to a structural shift in the allocation of resource from old industries - which are responsible for the supply of basic goods, to new industries - responsible for the supply of more luxurious goods. When consumers become fully satisfied with the existing products, new demands emerge and as a result, new goods must be introduced. This leads to an important bidirectional causality between structural change and growth whereby, the speed at which structural change occurs is determined by overall growth, and overall growth rates are influenced by the growth rates in the new industries because of the incentive they provide for innovation. Nonetheless, McMillan et al. (2014) point out that, if the growth of industries does not involve a change in the structure of employment, then the benefits derived from the inter-sectoral changes may be cancelled out by the lack of changes between sectors, and structural change can become growth reducing in this respect.

Specialization and product diversification

Moreover, some studies have also been carried out to draw attention to the importance of specialization and product diversification in structural change theories. Rodriguez-Clare (1996) builds a model that illustrates how economies with low a division of labour may end up into an underdevelopment trap. This paper shows that, when the production of specialized intermediate goods is characterised by increasing economies of scale, this leads to the possibility of a multiple equilibria; one where only a few specialized intermediate goods may be produced, and a Pareto superior equilibrium with a highly diversified production, higher wage rates and a relatively higher rate of capital return. The main implication of the model is that, when economies are stuck in the first equilibrium, they allocate only a few resources to the production of specialized inputs and

most firms produce goods that are highly reliant on labour. This in turn restricts the market size and provides no incentive to carry out the production of specialized inputs and, consequently, inhibits the accumulation of capital, which is needed to drive an economy out of an equilibrium with a shallow division of labour to the Pareto superior equilibrium. Furthermore, this also provides a possible explanation as to why some developing countries have been incapable of growing as fast as the Neoclassical models may have suggested.

Another strand of the literature, which adds to the above perspective on structural change has been highly influenced by the Ricardian theory of comparative advantage and, thereby, owes much to the role of globalization and international trade. Hausman et al. (2007) develop a model to show how the specialization in certain tradable goods can be associated with higher levels of productivity than in others. According to the authors, an economy's growth is brought about by the transfer of production factors from low to high productivity goods, an undertaking which is made identifiable by the process of cost discovery that entrepreneurs engage in. The authors develop an index that measures a country's quality of exports where high productivity goods are characterised by an elastic demand in the world market and rank higher on the quality scale. The evidence shows that countries that specialize in goods that rank higher on the spectrum, i.e., "rich country goods", will perform better than those specializing in "poor country" products. Furthermore, while the standard principles of comparative advantage model will generally caution against the advancement of specialization along the quality spectrum, this study shows that a country's endowments allow for the improvements in product quality, and this is mostly possible through overcoming the externalities from the cost discovery process.

Chapter 3. Structural change and economic development in Africa: an overview of the literature

There exists a large framework of academic literature that has been dedicated to the causal mechanisms between structural change and macroeconomic variables. However, considering the case of Africa, the literature has been mostly concentrated on the impact of structural change on growth and other fundamentals and has, to a lesser extent, focused on the factors influencing structural change in African countries. As such, the following section provides a review of some of these studies, including both sides of the mechanism, and focusing on the different dimensions of structural transformation: (i) resource allocation; (ii) accumulation; and (iii) demographic processes. A brief summary of this literature can also be found in Appendix A.2.

Resource allocation process

McMillan et al. (2014) perform a cross sectional analysis on 38 developing countries (from Africa, Asia and Latin America) to examine factors that help to determine the magnitude of structural change and whether or not it goes in the right direction. According to the results, countries with a comparative advantage in primary products are at a disadvantage. The study documents a negative relationship between the share of natural resources in exports and the productivity enhancing structural change. Moreover, policy variables such as currency undervaluation and labour market flexibility are also found to have a positive effect on structural change.

Morsy et al. (2014) use a regression analysis to identify the main factors that explain the level of structural change across a sample of 28 countries including 7 from Africa. The authors document a greater potential for structural change resulting from increased trade openness, access to credit and an initial surplus labour in agriculture. Similar to McMillan et al. (2014), the specialization in agriculture and primary commodities was also found to be detrimental to structural change.

An analysis for the impact of structural change on the growth performance of Africa is provided by Carmignani and Mandeville (2014). The study documents some stylized facts that point to the reallocation of resources from agriculture to services and the non-manufacturing industry. This results in a positive relationship between sectoral

concentration and income per capita and indicates a pattern of structural change with specialization (i.e., without diversification). In order to capture the effect of structural change on growth, the authors employ the use of a growth regression model and find that the shift from agriculture to services has not been growth impeding. The detrimental factor to growth is rather found to originate from the non-manufacturing industry, which suggests a resource curse for the continent since Africa is mostly dominated by mining. Furthermore, De Souza (2015) also employs a growth regression model on 62 developing countries including Sub-Saharan Africa and finds complementarities between agriculture and industrial development, whereby the growth of one percentage point in agriculture leads to the growth of manufacturing by between 0.28 and 0.58 percentage points.

Using data from a sample of 21 developed and 67 developing countries from Latin America, Asia and Africa, Szirmai and Verspagen (2015) investigate the role of manufacturing as the driver for growth and development during the period 1950 to 2005. The analysis provides evidence for manufacturing as an engine of growth for both the developed and developing countries, nonetheless, there also exists a negative impact on the interaction between manufacturing and relative GDP per capita, proving the effectiveness of resource allocation to the manufacturing sector during the early stages of development. However, splitting the sample into three sub periods shows that manufacturing has become less effective since the 1990s due to the greater amounts of human capital it now requires to achieve the same marginal effects on growth as it did in the earlier periods, and this explains why some countries are no longer benefiting from manufacturing as an engine of growth.

Accumulation process

Mengistu (2009) assesses the effects of human and physical capital on structural change (through export diversification) in Sub-Saharan Africa (SSA) and East Asia from 1975-2004. Using the feasible generalized least squares technique on 30 years of panel data for 41 countries, the results show that domestic investment and human capital are important factors for stimulating diversification in both regions. However, the effect of Foreign Direct Investment (FDI) is found to be insignificant in SSA, which seems to imply that the FDI to SSA is below the threshold level required to induce a process of structural change.

In addition, Szirmai and Verspagen (2015) find a positive and significant effect on the interaction between manufacturing and education, which implies that manufacturing yields positive effects on growth in developing countries with a highly educated workforce. However, using a panel of 168 countries (with 23 African economies) Dabla-Norris et al. (2013) find no significance for tertiary enrolment on the value added share of manufacturing. The authors instead document a positive and significant effect of tertiary education on the value added share of services. Furthermore, Marouani and Mouelhi (2016) show that, in the case of Tunisia, the enormous investment in tertiary education has had a negative impact on structural change. According to the authors, the increased investment in tertiary education was not accompanied by an improvement in the skills of high value added activities, and without the motivation to invest in this kind of tasks, increasing investment in education is no longer a sufficient condition.

Demographic and distributional processes

Dabla-Norris et al. (2013) perform an encompassing characterization of structural transformation across a large sample of developed and developing countries over the period 1970-2010. Using pooled Ordinary Least Squares (OLS) and quantile regressions, the study explores the effects of a number of country fundamentals and policy variables on the value added shares of agriculture, manufacturing and services. The results show that country fundamentals such as age dependency ratios, population size and land area explain about 70% of the variation in the shares of agriculture and services around the world. The quantile regressions also support these findings, with greater importance given to the share of agriculture, where the significance of these variables is found to be increasing across the distribution. Furthermore, augmenting the models with policy variables also springs evidence for the importance of trade openness and other policy indicators on structural change.

Aksan (2014) uses individual survey data from 1998 to 2008, on woman in 30 SSA countries to establish the effect of childhood mortality and morbidity on demographic transition in the region. The author finds that, while results are in support of the long standing positive relation between child mortality and fertility rates, childhood morbidity has weakened this relation. This occurrence is subsequently attributed to the

lack of health capital for children, which in turn alters the trade-off between quality and quantity for children through lower expected returns to human capital investment.

De Brauw et al. (2014) evaluate the contribution of migration to urbanization in SSA. According to this study, population weighed rural-urban migration averaged 1.07% per annum between 1990 and 2000. However, few other countries such as Cote D'Ivoire and Botswana also experienced negative rural-urban migration in the same period, which indicates that re-ruralization is also occurring in the region. Furthermore, returns to labour in the rural also appear to be lower than in the urban areas, which shows that the absence of urbanization may have an obstructing effect on growth. In addition to this study, Christiaensen and Todo (2014) use the fixed-effects panel estimation techniques to explore the role of urban transformation on development in 51 developing countries (including 14 from SSA) from 1981 to 2004. The results indicate faster growth and higher income inequalities that go together with the migration from rural to mega cities, while the spread between rural non-farming and secondary town activities are associated with greater distributional power although with a slower growth process.

Chapter 4. Structural change analysis: the case for Lesotho

The development economics literature has emphasised the role of structural change in accelerating the catch-up process and fostering sustainable economic development (e.g. Chenery and Syrquin (1975), Todaro and Smith (2011) and McMillan et al. (2014)).

This chapter will focus on Lesotho as a case study. Lesotho is quite an interesting case to study because this small and landlocked country fell far behind other peer African countries with which it had a similar level of economic development (See Appendix A.1 for a comparison of how other small landlocked countries like Swaziland and Rwanda have outperformed Lesotho).

First, we describe the patterns of structural change in Lesotho over the past two decades, which is followed by a shift-share analysis that aims to explain the role of structural change on labour productivity growth in Lesotho.

4.1 Patterns of structural change in Lesotho

In this section we characterize the process of economic development in Lesotho between the period 1990-2015. For this purpose, we follow closely Chenery and Syrquin (1975) on the basic processes that the authors used to describe the different dimensions of structural transformation of a poor country into a rich one. According to the authors, it is more meaningful to consider all processes individually than to use a single dimension such as industrialization or urbanization as a sole representation of the development process. The different statistical sources used in this section are summarized in Appendix A.3.

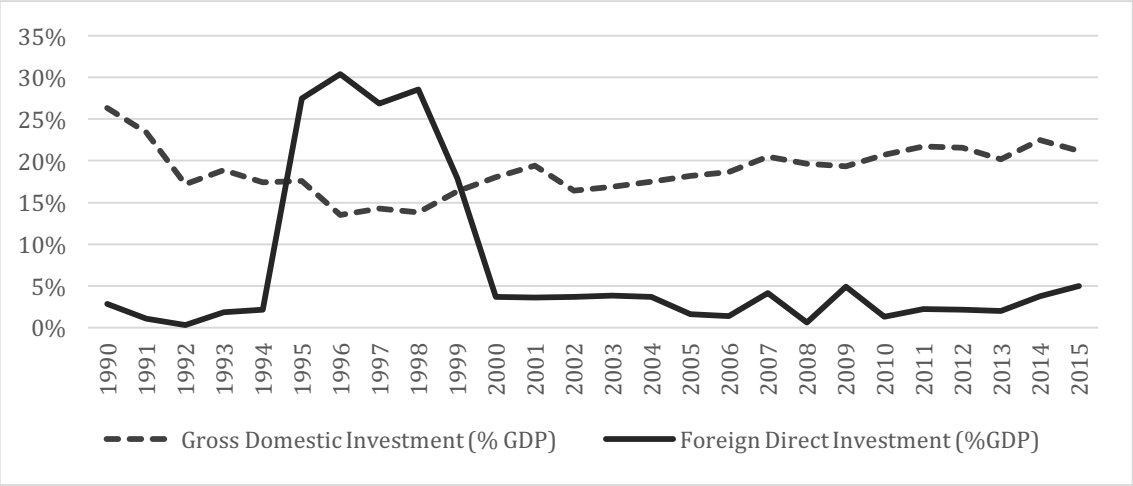
Accumulation processes

There appears to be a strong consensus in the development economics literature about the potential benefits of capital accumulation on sustainable development and long term growth. Early economic development models such as Rostow's stages-of-growth model and the Harrod-Domar model have typically emphasised the importance of investment as a driver of growth. However, according to Todaro and Smith (2011), this mechanism alone is not sufficient and is dependent on other conditions to ensure the

absorptive capacity of an economy, among which a well-trained and educated workforce is included.

Following Chenery and Syrquin (1975), we consider three variables that maybe used as proxies to explain the evolution of physical and human capital accumulation in Lesotho: investment as percentage of GDP, government revenue as percentage of GDP and the gross enrolment ratio of the secondary school population. Figure 1 shows the relative importance of domestic investment in the investment structure for the period 1990-2015. As it is possible to observe in the Figure, the share of Gross Domestic Investment in GDP has varied marginally between the beginning and the end period: starting at 26% in 1990 to 21% in 2015. However, it also dropped to a minimum of 13% in 1996, as FDI reached a maximum share of 30%, which may suggest the possibility of a crowding out effect between FDI and domestic investment in Lesotho.

Figure 1: Investment (Domestic and Foreign) (% GDP), 1990-2015



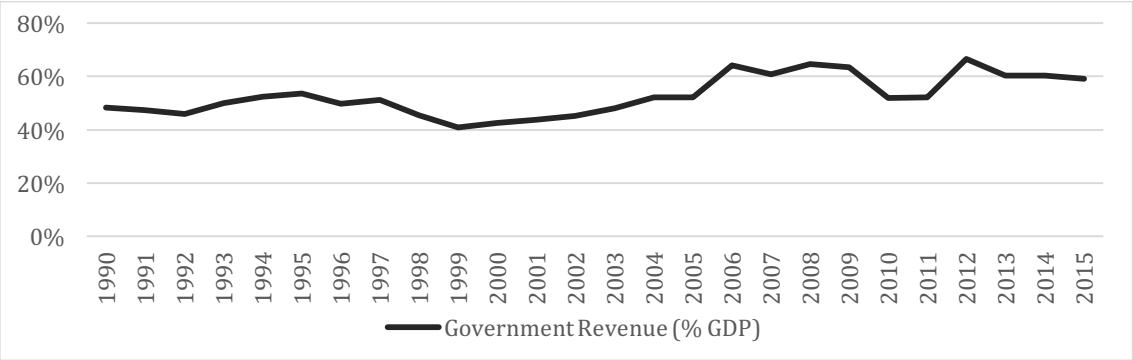
Source: Own computation (data sources: see Appendix A.3).

Except for the strong surge of foreign investment inflows in the mid-nineties, the share of FDI has remained subdued for the entire period, ranging between 0.3% and 4% of GDP. According to Malefane (2007), the increased share of FDI in 1994 came as a result of the public sector reforms, which included the privatization of state owned enterprises. However, this increase in FDI was short lived and sharply declined (from 30% in 1996 to a low of 3% in 2000), following the political unrests of 1998. FDI also suffered another apparent fall in 2008, indicating a possible casualty to the onset of the global financial crises. Furthermore, the overall level of investment within the economy

is arguably low, and this poses uncertainty regarding the economy's future productive capacity.

Figure 2 illustrates the evolution of Government revenue between 1990-2015. During this period, the share of government revenue in GDP had a range of between 40% and 66%. Coming from a low share of 40% in 1999, government revenue assumed an upward trend through to 2006. According to the Central Bank of Lesotho (2012), part of the reason for this improvement was due to the undertaking of some major fiscal reforms, which included the establishment of an autonomous tax collection body - the Lesotho Revenue Authority. The relevance of government revenue in capital accumulation stems from its role as a source of public investment in the economy. This is further revealed by the moderately similar trend between the share of government revenue and the share of government expenditure (Figure 4). Furthermore, the biggest source of government revenue in Lesotho is the Southern African Customs Union (SACU) receipts, which accounts for over 50% of government revenue (Central Bank of Lesotho, 2012).

Figure 2: Government revenue (% GDP), 1990-2015

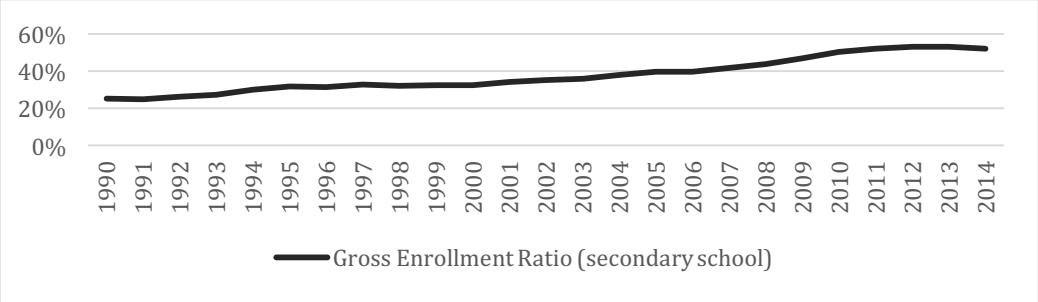


Source: Own computations (data sources: see Appendix A.3).

Human capital accumulation is regarded an important aspect of capital formation, and this is mainly due to its ability to increase the productivity and earning potential of individuals in the economy. In its most general form, human capital accumulation is often represented by the development of humans in health and skills (Todaro and Smith, 2011). As thus, measures such as the mean years of schooling, literacy rates and secondary and

tertiary education attainment are most commonly used as proxies.[3] Figure 3 below, shows a continual increase in the gross enrolment ratio in secondary school in Lesotho. The enrolled proportion of the age group corresponding to the secondary school level has doubled within the period under study, rising from 25% in 1990 to 52% in 2014. Furthermore, as part of the country's targets for the 2015 Millennium Development Goals, Lesotho implemented a free primary education policy in 2000 (Morojele, 2012), a possible reason behind the high literacy rates of 86% and 79% in 2010 and 2015, respectively (UNESCO, 2017), as well as the increased secondary school enrolment ratio towards the end of the decade.

Figure 3: Human capital accumulation, 1990-2014



Source: Own computations (data sources: see Appendix A.3).

Resource allocation processes

Economic theory and empirical evidence confirm the impracticality of a model of long term growth that does not involve some shift of resources from primary production to industry as well as a change in the composition of demand (Chenery and Syrquin, 1975). The analysis in terms of resource allocation is here characterized by considering the following processes: the structure of public expenditure,[4] production by economic activity and the structure of exports.

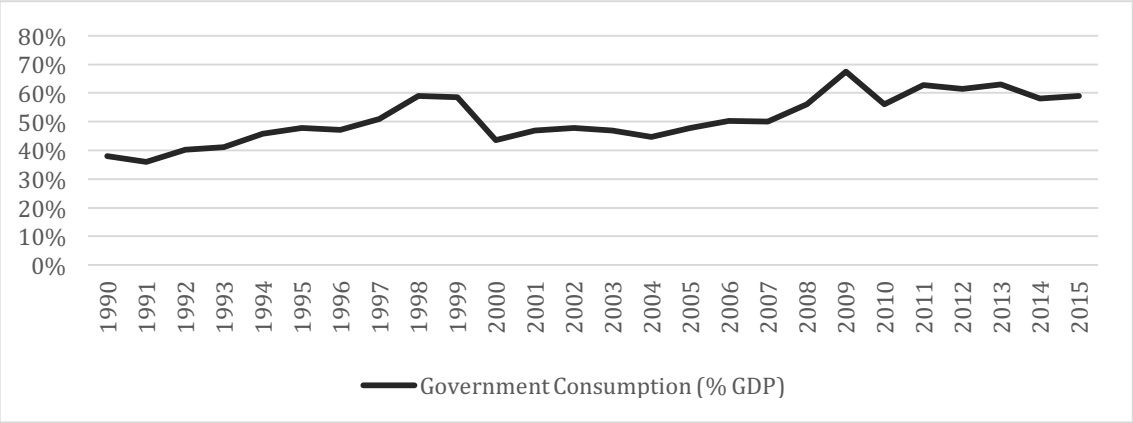
Public expenditure has had an important weight in domestic demand since the beginning of the period under analysis, and generally continues to grow with the years. As illustrated in Figure 4, there have been two notable hikes within the study period: from

[3] This study uses the gross enrolment in secondary school because of its availability for the considered study period.

[4] Although it would be more adequate to look into the components of public expenditure such as the ratio of health or education expenditures in GDP, we use the ratio of public expenditure for reasons of data availability.

1998 to 1999, where the ratio of government expenditure was at 58%, and an even higher share at 67% in 2009. However, the hike in 1998 might have been due to the 1998 general elections, which also prompted arson attacks in the country. Moreover, education expenditure averaged around 26% of government spending between 2000 and 2005, while the weight of health expenditure also increased from 6% in 2005 to 13% in 2014 (WDI, 2017). Furthermore, the high importance of government spending on domestic demand in Lesotho also indicates that private consumption is rather low.

Figure 4: Public expenditure (% GDP), 1990-2015

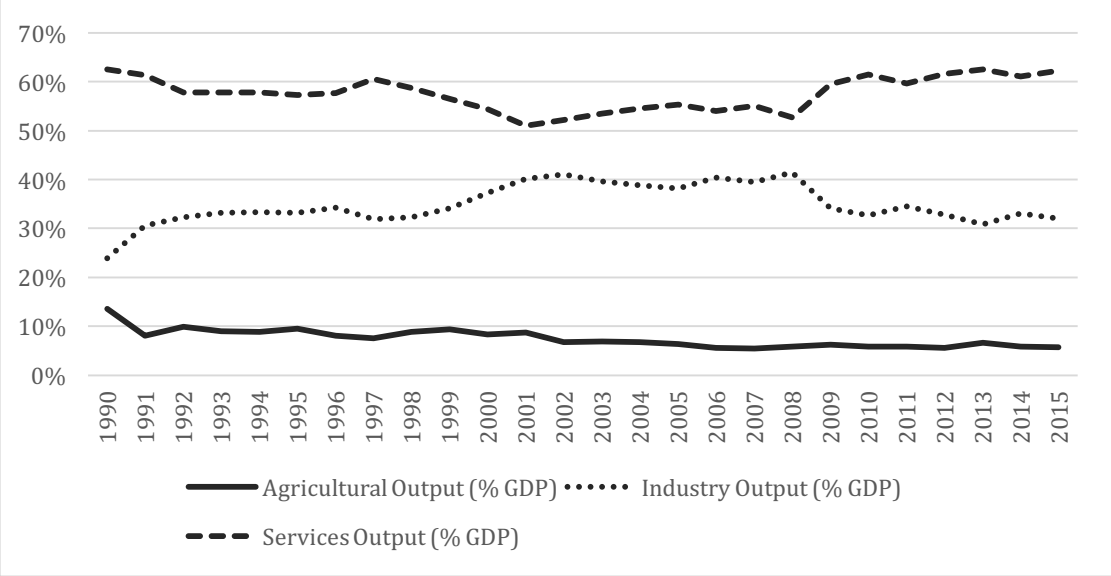


Source: Own computations (data sources: see Appendix A.3).

From 1990 to 2015, the structure of production in Lesotho has remained relatively the same. The service sector accounted for the largest share of GDP followed by industry, while agriculture accounted for the least proportion. Figure 5 also shows that the share of agriculture in GDP dropped by more than half in the observed period, falling from 13% in 1990 to 5% in 2015. Moreover, there appears to be an increasing momentum in the share of industry between 1999 and 2008, with the average share of industry in GDP around 10 p.p. higher than in the earlier period. This may have been brought about by the improved trade relations between Lesotho and the United States of America, since Lesotho gained eligibility for trade benefits under AGOA in 2000 (Central Bank of Lesotho, 2011). In fact, Figure 7 shows that textile exports accounted for an average of 71% of total merchandise exports between 2000 and 2008. However, as can be seen in Figure 5, the 2008 crises also seems to have coincided with the declining contribution of the industrial sector, causing a convergence in the share of industry to the pre-2000 levels. Furthermore, the increasing gap between the share of services and industry in recent years

could also suggest that production is heading in the 'wrong' direction as it gives rise to the tertiarization of the economy – a change that is commonly known to cause a structural burden in the form of Baumol's disease (Carmignani and Mandeville, 2014).[5]

Figure 5: Structure of production, 1990-2015



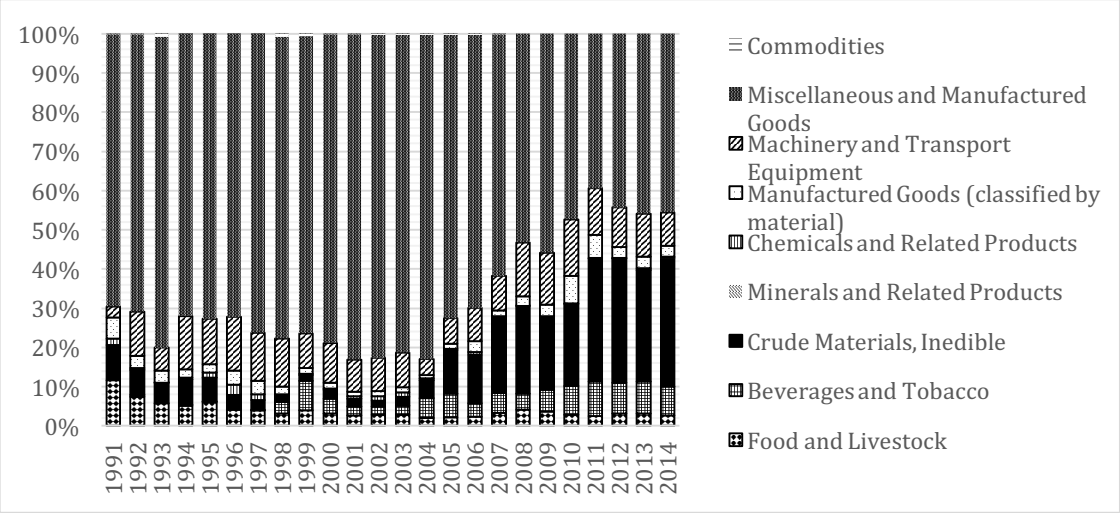
Source: Own computations (data sources: see Appendix A.3).

Figure 6 below represents the structure of exports covering the period 1991-2014. Between 1991-2004, export trade was virtually dependent on *miscellaneous and manufacturing*, ranging between 70% and 83% while all other categories each accounted for between 0% and 4% on average, except for *machinery and transport equipment*, which had an average share of 9% between 1991 and 2004. Moreover, the position of *miscellaneous and manufacturing* goods took a plunge from 2005, accounting for half of total exports as compared to an average of 76% in the previous period, possibly suggesting an increasing diversification in the export structure. However, Figure 7 shows that export growth in Lesotho is mostly driven by the export of two types of goods: textiles and diamonds, which together accounted for over 75% of total merchandise exports in 2014 and 2015. The highly increasing share of diamond exports (from 1% in 2003 to 34% in 2015) also signifies an emerging dependency on the mining sector. This

[5] When the wages of the labour intensive, low productivity services sector increases in response to the increasing wages of sectors that are experiencing productivity growth, this results in the slowdown of income per capita and is known as Baumol's disease (see for example; Carmignani and Mandeville (2014) and Herrendorf et. al (2013)).

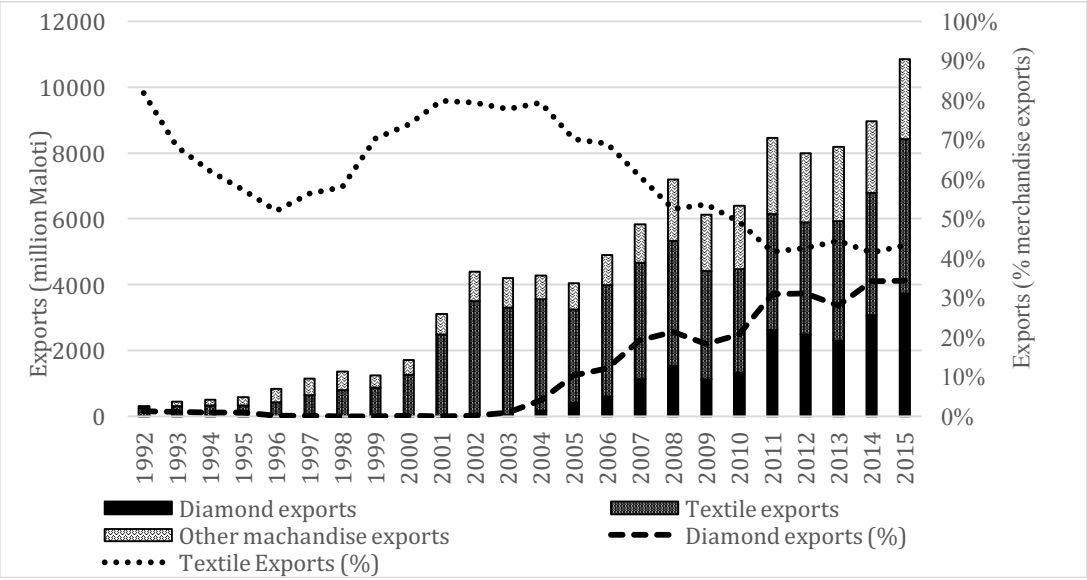
is usually associated with potential negative effects due to the existence of limited linkages with the rest of the economy, which results from its enclave nature.

Figure 6: Structure of exports, 1991-2014



Source: Own computations (data sources: see Appendix A.3).

Figure 7: Exports of diamonds and textiles, 1992-2015



Source: Own computations (data sources: see Appendix A.3).

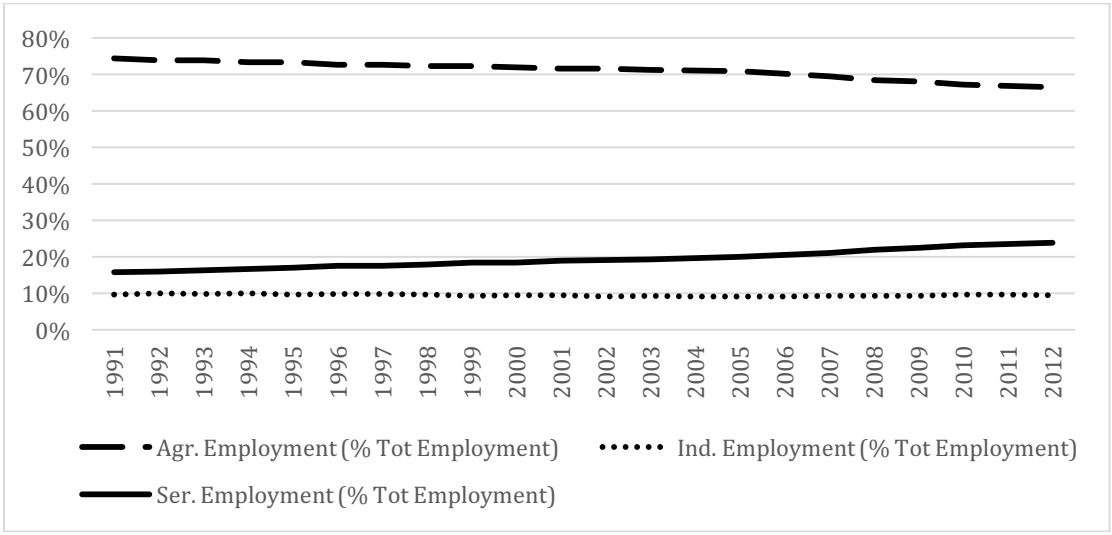
Demographic processes

Evidence from more advanced countries suggests uniformity in the demographic patterns during the development process, usually including the movement of the population from rural to urban locations and a demographic transition resulting in lower

birth and death rates (Chenery and Syrquin, 1975). We characterise population dynamics in Lesotho from 1990 to 2015 by considering: the structure of employment within the three broad sectors of economic activity, the process of urbanization and nature of the demographic transition.

The structure of employment in Lesotho has experienced rather minor changes within the period 1991-2012. While it is clear that the share of employment in agriculture is slowly decreasing, the primary sector remains the most significant source of employment, accounting for over 65% of total employment between 1991 and 2012. The comparison between the high weight of agriculture in employment and the low share of the sector's output in GDP (Figure 5) suggests that productivity levels in agriculture are rather low, this could further imply the possibility of disguised unemployment in the sector. Moreover, the share of services employment is slowly gaining momentum in recent years while the industry sector is extremely low and remains the least significant,[6] registering a minimum share of 9% and a maximum of 10% within the whole period.

Figure 8: Structure of employment, 1991-2012



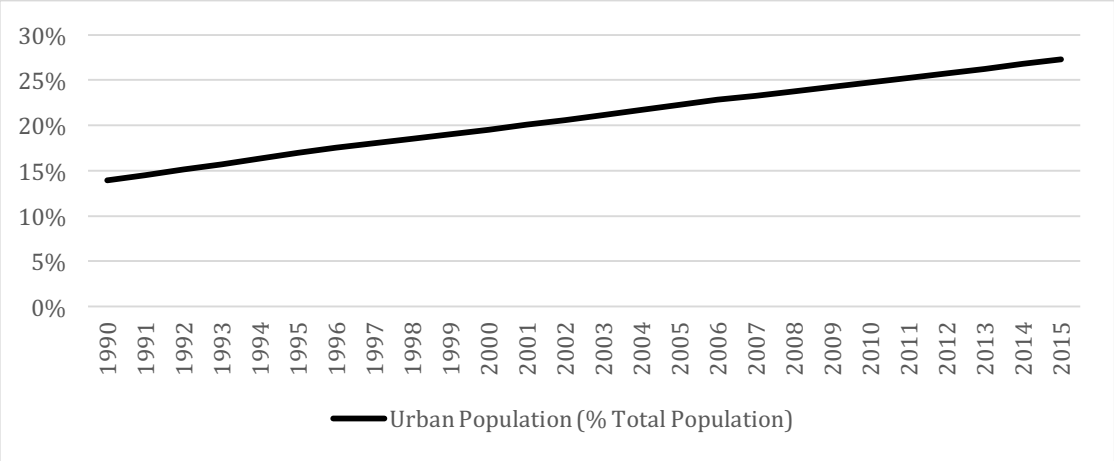
Source: Own computations (data sources: see Appendix A.3).

Figure 9 shows that the process of urbanization in Lesotho is rapidly increasing. 27% of the population lived in urban areas in 2015 compared to only 14% in 1990. According to Moyo et al. (2014), this increase was partly a result of the natural increase

[6] The share of industry employment in developing countries outside SSA is estimated between at least 20% and 30% (ILO, 2014).

of urban population in Lesotho. A glance at Figure 10 shows that, the total economy experienced a natural increase of about 13 births per 1000 of the population in 2014. Additionally, the increase in urban population can also be a result of migration from rural-agricultural areas to urban-industrialised areas, given the declining share of agriculture in employment (Figure 8). However, urbanization seems to be occurring at a faster pace than the process of industrialization (Figure 5). This may trigger the prevalence of urban unemployment and increase the participation of labour in the informal sector. Furthermore, this type of urbanization also gives rise to the non-tradable sector (tertiarization), which can lead to slower growth in the long run (Gollin et al., 2016). Moreover, Maphosa and Morejele (2013) explain that, Lesotho had previously served as a labour reserve (of uneducated, and unskilled able-bodied man) for the South African mining sector, but the global weakening of gold prices in the 1990s lead to the retrenchment of a large number of Basotho mine workers. This might have possibly fuelled the high rural-urban migration noted by the Bureau of Statistics (2013) between 1996 and 2011.

Figure 9: Urbanization, 1990-2015

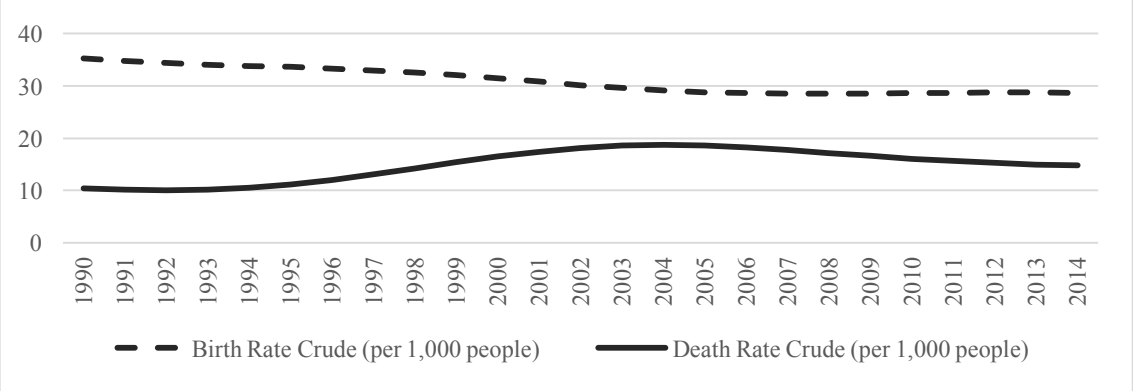


Source: Own computations (data sources: see Appendix A.3).

As can be observed from Figure 10, the beginning of the 1990s can be said to have fairly resembled some of the characteristics of an early transition stage, where the birth rate was significantly declining and the mortality level was much lower. Beginning from 1993, the mortality rate in Lesotho escalated and reached a maximum of 18 deaths per 1000 of the population in 2005, possibly reflecting the impact of HIV and AIDS in Lesotho. According to the Central Bank of Lesotho (2004), nearly one third of the

economically active population was infected by HIV, and the life expectancy at birth dropped by 16 years between 1990 and 2005 (WDI, 2017). The remaining period exhibits an improvement in the mortality rate, although still around 50% higher than the early 1990s.

Figure 10: Birth and Death rates, 1990-2014

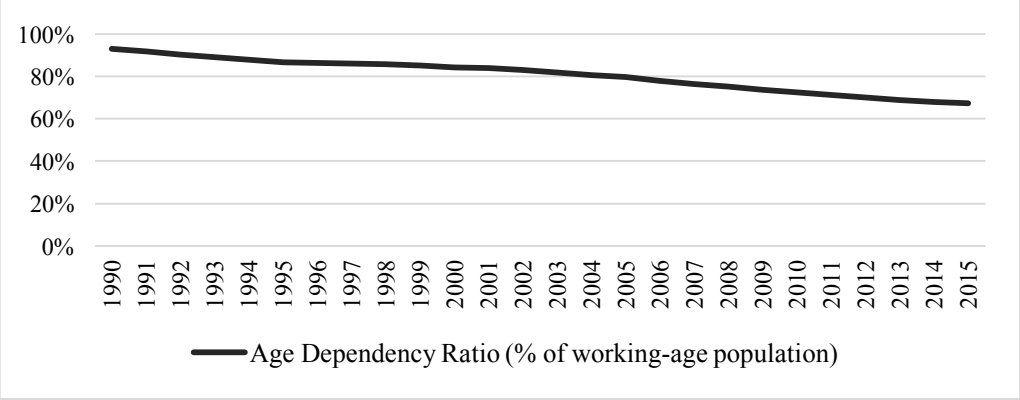


Source: Own computations (data sources: see Appendix A.3).

The age dependency ratio of a country relates the proportion of the economically dependent population to the proportion of the economically active. Although it may not be directly related to structural change, the dependency ratio is expected to decrease with falling mortality and fertility rates. As such, it is a vital pointer for the intensity of the financial burden on the economically active population and the extent to which social assistance from the government may be required. Figure 11 displays a decline in the dependency ratio from 1990-2015. This presents a window of opportunity for Lesotho resulting from the growing number of potential producers relative to the number of dependents.[7]

[7] If the income per person of the economically active population is to remain unaffected, the decline in the number of dependents per worker would by itself raises the per capita income (Lee, 2003).

Figure 11: Age Dependency Ratio (% of working-age population), 1990-2015



Source: Own computations (data sources: see Appendix A.3).

4.2. The role of structural change on labour productivity growth

In order to understand the role of structural change on labour productivity growth in Lesotho, we will proceed with a shift-share analysis. After a brief overview of this methodology, we discuss the main results.

Methodology: shift-share analysis

To explain the contribution of structural change on labour productivity growth, this study employs a shift share analysis. This is a purely descriptive technique that has been commonly adapted in the structural change literature, and is aimed at separating the growth of an aggregate into various components. This is done to reflect the contribution of the *between* and *within* sector changes on labour productivity growth (Fagerberg, 2000). Other examples considering the application of this methodology on the structural change literature include: de Vries et al. (2011), McMillan and Rodrik (2011) and Marouani and Mouelhi (2016).

Following Fagerberg (2000), labour productivity P can be computed as:

$$P = \frac{Q}{N} = \frac{\sum_i Q_i}{\sum_i N_i} = \sum_i \left[\frac{Q_i}{N_i} * \frac{N_i}{\sum N_i}\right] \quad (4.1)$$

where i correspond to sectors $1,2, \dots, m$, P is labour productivity, Q is the value added, and N is the labour input.

Let $P_i = \frac{Q_i}{N_i}$ be the labour productivity in industry *i*, and $S_i = \frac{N_i}{\sum_i N_i}$ the share of sector *i* in total employment. Substituting P_i and S_i into (4.1) we have:

$$P = \sum_i P_i * S_i \tag{4.2}$$

Assuming that:

$$\Delta P = P_1 - P_o \; and \; \Delta S = S_1 - S_o$$

And using (4.2), we get

$$\Delta P = \sum_i [P_{io}\Delta S_i + \Delta P_i \Delta S_i + S_{io}\Delta P_i] \tag{4.3}$$

or, expressed in terms of a growth rate:

$$\frac{\Delta P}{p_o} = \sum_i \left[\frac{P_{io}\Delta S_i}{P_o} + \frac{\Delta P_i \Delta S_i}{P_o} + \frac{S_{io}\Delta P_i}{P_o}\right] \tag{4.4}$$

From equation (4.4), we can observe that:

$\frac{P_{io}\Delta S_i}{P_o}$ computes the contribution of productivity growth resulting from the relocation of labour between sectors (i.e., the *employment effect*).

$\frac{\Delta P_i \Delta S_i}{P_o}$ computes the interaction between the change in labour productivity within the individual sectors and the relocation of labour between sectors (i.e., the *interaction effect*).

The *structural change effect* (or *between effect*) is, therefore, obtained by summing these two effects. Lastly,

$\frac{S_{io}\Delta P_i}{P_o}$ computes the contribution to productivity growth which results from the change in labour productivity within the individual sectors (i.e., *within effect*).

One of the main limitations of the shift-share methodology stems from its static nature. In most applications, the technique is applied over a period of several years although only examining changes between the initial and the end periods. This means that the continuous changes over the study period are not taken into account (Barff and Iii, 1988). However, the authors also show that, these limitations can be overcome by using a more dynamic approach which involves calculating the shift-share effects on an annual basis and summing the results over the study period. Moreover, since the model is primarily descriptive in nature, it does not identify the causes of change, hence, it becomes more useful to combine the shift-share analysis with an exploratory regression, so as to give reason for the resultant changes (Andrikopoulos et al., 1990).

There are several adaptations that have been made to the shift-share method, with the major differences primarily placed on the choice of base year used (Fagerberg, 2000). According to this last study, when the initial or final year weights are applied in decomposition, a residual will normally occur, and what the variations of this method are predominantly trying to achieve is a residual that is as limited as possible. This task is considered relatively easy to attain, since the very reason for a residual results from the interaction between the different variables used in the analysis.

Data and results

To employ the shift-share analysis for Lesotho, we use sectoral data on employment and value added obtained from the International Labour Organization (ILO), for the two periods 1999 and 2008, for which full, uniform sectoral data are available, and thus our study is limited to a static analysis.

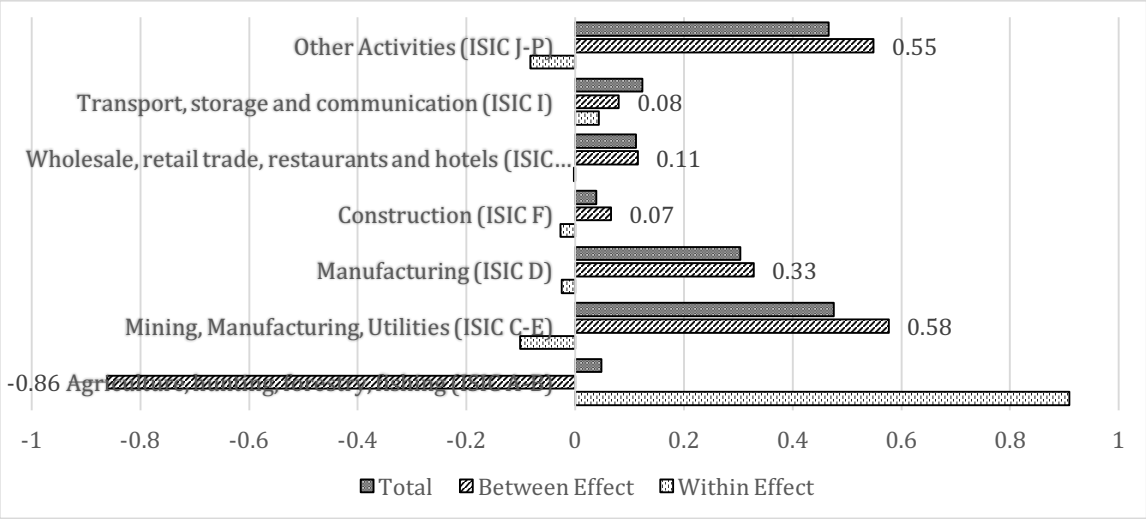
According to Fagerberg (2000) and McMillan and Rodrik (2011), labour productivity growth in the economy can be achieved in one of two ways: firstly, through the intra-sectoral (*within*) effect, which can result from among other factors, the accumulation of human and physical capital or technological progress within a sector, and secondly, from the inter-sectoral (*between* or *structural change*) effect, or more specifically, when labour moves from a low productivity sector to high productivity sectors in the economy. Table 1 presents results from the decomposition of labour productivity growth using equation (4.4) while Figure 12 presents a graphic summary of the decomposition results, specifying the *structural change effect* as a combined effect between the *employment* and *interaction* terms from Table 1.

Table 1: Decomposition of productivity growth (1999-2008)

Sector	Within	Employment Effect	Interaction Effect	Total Productivity Growth
Agriculture, hunting, forestry, fishing (ISIC A-B)	0.91	-0.10	-0.76	0.05
Mining, Manufacturing, Utilities (ISIC C-E)	-0.10	1.71	-1.13	0.48
Manufacturing (ISIC D)	-0.02	0.43	-0.10	0.30
Construction (ISIC F)	-0.03	0.10	-0.04	0.04
Wholesale, retail trade, restaurants and hotels (ISIC G-H)	0.00	0.12	0.00	0.11
Transport, storage and communication (ISIC I)	0.04	0.04	0.04	0.12
Other Activities (ISIC J-P)	-0.08	0.68	-0.14	0.47
All	0.71	2.98	-2.13	1.57

Source: Own computations with data from the *International Labour Organization* (http://www.ilo.org. Accessed on 07.03.2017).

Figure 12: Decomposition of productivity growth (1999-2008)



Source: Own computations with data from the *International Labour Organization* (http://www.ilo.org. Accessed on 07.03.2017).

As presented in Table 1, labour productivity in Lesotho grew by 1.57 points between 1999 and 2008, of which 0.85 points (54%) resulted from the *structural change* component while the remaining 0.71 points (46%) was attributable to *within* sector changes. Although no adjustments have been made to account for the temporal limitations of our model, the above results provide support for the importance of the role of structural change on labour productivity growth in Lesotho between the two periods. Moreover, the realization of a positive structural component for the total economy indicates a shift of labour from low to high productivity sectors. This means that labour in Lesotho has shifted out of agriculture (indicated by the negative *between effect* from Figure 12) to higher productivity sectors such as *mining, manufacturing utilities* and *manufacturing* (indicated by the positive *between effect* from Figure 12). Taking a look at Figure 12 further reveals that the *mining, manufacturing, utilities* and the *manufacturing* industries were the main drivers behind the growth enhancing structural change, contributing to the growth of labour productivity by 0.58 points (36%) and 0.33 points (21%), respectively.

However, although the *structural component* between 1999 and 2008 is positive and of high significance to productivity growth, the analysis also uncovers a negative correlation between the relocation of labour and productivity growth. This suggests a plunge in the productivity growth of the employment expanding sectors, with the exception of only two sectors: *transport, storage and communication* and *wholesale,*

retail trade, restaurants and hotels, where both the labour share and productivity growth are increasing concurrently. This further signifies the shift of resources towards the production of the non-tradable sector, and the incapacity of high productivity sectors to absorb the labour from agriculture and other low productivity industries.

Chapter 5. The determinants of structural change: The case for SSA

As already mentioned in the previous chapter, the shift-share methodology is a purely descriptive technique, which does not reveal much information about the causes of the observed structural changes. In this regard, it is better to combine the previous method with an econometric confirmatory regression.

In this chapter, we aim to identify the determinants of the structural change magnitude in Sub-Saharan Africa (SSA) over the period 1992-2012. One of the biggest challenges encountered with this analysis was the dearth of secondary data across the region. As a result, half of the SSA countries were excluded from the sample.[8] Thus, the choice of countries and study period were determined primarily on the basis of data availability, using annual data from two main sources: the Groningen Growth and Development Centre (GGDC) database and the World Development Indicators (WDI). Table 2 shows the list of countries included for the analysis, and more information regarding the chosen variables is discussed later on in the chapter.

Table 2: List of countries by region

East Africa	Kenya, Sudan, Tanzania, and Uganda
Central Africa	Burundi and Rwanda
Southern Africa	Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia and Swaziland
West Africa	Burkina Faso, Cameroon, Gambia, Guinea, Mali, Nigeria, Senegal and Togo

5.1. The model

Since the described data is characterized by a combination of time series and cross-sectional dimensions, the study employs panel data techniques, which are typically classified by three approaches: (1) the pooled OLS estimator - which proceeds by disregarding the panel structure of the data, (2) the random-effects model - which assumes that the time constant individual effects are uncorrelated with the independent variables and (3) the fixed-effects model - which assumes a correlation between the time invariant individual effects and the explanatory variables (Johnston and DiNardo, 1997).

[8] Except for the case of South Africa, which was excluded because of its economic position as an emerging economy.

Furthermore, Johnston and DiNardo(1997) and Greene (2000) also propose that, due to the nature of the pooling method to disregard the different attributes of individuals, the pooled OLS estimation may not be an appropriate technique for panel data. The authors further recommend the use of random and fixed-effects models which are also required to be preceded by specification tests in order to determine a trade-off between the two models.

As stated previously, the aim of this study is to analyse factors that influence structural change in SSA. For this purpose, we consider variables that are typically employed in the structural change literature (see Chapter3). As such, our regression equation can be described as follows:

$$SC_{it} = \beta_1 + \beta X_{it} + \varepsilon_{it} \quad (5.1)$$

where i represents the i^{th} cross-section$(i = 1, \dots, 21)$, t represents the period $(t = 1992, \dots, 2012)$ and,

SC_{it} is the dependent variable and refers to the rate of structural change for country i at year t;

β_1 is the common intercept;

β is the vector of coefficients associated with the explanatory variables;

X_{it} is the vector of explanatory variables of country i at time t;

ε_{it} is the error term for country i at time t.

5.2. Data

Dependent variable

The dependent variable SC_{it} corresponds to the level of labour productivity growth (LPG) that is attributable to structural change in the SSA region. To construct our variable, we use a dynamic form of equation (4.4) for the period 1992-2012. The employment and value added data for each of the sectors is obtained from the GGDC and WDI, respectively. However, due to the lack of detailed sectoral employment data, we limit our analysis to the disaggregation of data into the three main sectors of agriculture, industry and services. Following (4.4), the equation used for computing the dependent variable can be expressed as follows:

$$SC_{it} = \sum_{j=1}^{3} \frac{P^{j}_{i(t-1)} \Delta S^{j}_{it}}{P_{i(t-1)}} + \frac{\Delta P^{j}_{it} \Delta S^{j}_{it}}{P_{i(t-1)}} \quad (5.2)$$

where i is the i^{th} country$(i = 1, \dots, 21)$, t is the year $(t = 1992, \dots, 2012)$, P is labour productivity, S is the share of employment and j is the j^{th} sector $(j = 1,2,3)$.

Using the results from equation (5.2), Table 3 displays the country rankings of the cumulative labour productivity growth attributable to the structural component. Of the 21 SSA countries included in our sample, structural change has been growth enhancing in 9 countries while the remaining 12 have experienced negative levels, with Botswana and Mauritius as the lowest performers. This also highlights the fact that, the productivity growth in over half of the sample emanated from the intra-sector developments (*within effect*). However, looking at the yearly contribution of structural change reveals that for some of the bottom 12 countries like Burundi and Lesotho, negative levels were mostly recorded in the first decade, while positive levels seem to be more dominant in the recent decade, highlighting the importance of structural change in recent years. The highest contribution of structural change is realized by Tanzania and Mozambique, followed by Malawi, Nigeria and Uganda, all of which stand between 20% and 29% of labour productivity growth. Furthermore, West Africa appears to be the worst performing region, with 6 out of 8 countries recording negative levels of structural change.

Table 3: Ranking of Structural Change by Country (1992-2012)

Ranking	Country	Structural change component (%)	Ranking	Country	Structural change component (%)
1	Tanzania	29.00	12	Lesotho	-1.47
2	Mozambique	28.50	13	Mali	-4.11
3	Malawi	20.56	14	Cameroon	-7.70
4	Nigeria	20.40	15	Guinea	-8.66
5	Uganda	20.20	16	Gambia	-9.13
6	Rwanda	14.80	17	Burkina Faso	-9.96
7	Senegal	11.32	18	Burundi	-13.83
8	Kenya	5.73	19	Namibia	-22.49
9	Swaziland	4.76	20	Mauritius	-24.87
10	Sudan	-0.28	21	Botswana	-55.61
11	Togo	-0.45			

Source: Own computations.

Explanatory and control variables

Considering the commonly employed variables in the structural change literature (see Chapters 2 and 3), we use the following explanatory and control variables in order to capture the processes of resource allocation, capital accumulation and demographic changes:

- Physical Capital
  - ***Domestic investment (INV)***: refers to the ratio of gross capital formation (in fixed assets) to GDP. The accumulation of fixed capital is a vital source of labour productivity growth, and this makes it a crucial indicator for the potential of long term growth and future productivity levels. Furthermore, investment also provides incentives for workers to move from low to high productivity sectors as wages in those sectors increase (Morsy et al., 2014).
  - ***Foreign direct investment (FDI)***: signifies the ratio of net foreign direct investment (inflow) to GDP. FDI serves as an important vehicle for structural change, and can be expected to contribute to growth through improved technology and higher productivity levels (Borensztein *et al.,* 1998). However, the success of FDI also depends highly on the manner in which capitalists integrate the global economy (McMillan and Rodrik, 2011). When FDI is fixated on shifting the production of labour intensive goods offshore, then the success will only be limited to the industries at the lower end of the technology level, which are associated with low productivity employment opportunities (Ozawa, 2003).

- Human Capital
  - ***Education (EDU)***: is the total enrolment in secondary school (regardless of age) expressed as a percentage of the age group that officially corresponds to secondary school level.[9] Human capital is an important determinant human development and the earning potential of individuals. According to Benhabib and Speigel (1994), the education level of individuals affect productivity by enhancing the capacity of countries to innovate new technologies. Thus, a more skilled workforce

[9] The coverage of this indicator by WDI database was not complete for most SSA countries. As a result, missing values were estimated using the nearest neighbor.

encourages the shift to activities of higher productivity. Furthermore, positive externalities through learning by doing (i.e., on the job training) are stronger with higher education levels (Lucas, 1988), and this can encourage workers to venture out on their own and strengthen the growth of the private sector.

- Urbanization
  - ***Urban population (URB POP)***: indicates the ratio of urban population to the total population in the economy. The success of a structural transformation is dependent on the transfer of excess labour from the traditional to the modern sector. This is led by a shift in the habitual location from rural to urban areas (McMillan and Rodrik, 2011). However, when industrialization occurs at an unequal, slower pace compared to the rate of urbanization, this gives rise to the activities of the informal sector as well as the non-tradable services, which can further inhibit growth in the long run (Gollin et al., 2016).

- Globalization
  - ***Trade openness***: refers to the ratio of export and import merchandise to GDP. According to Melitz (2003), a country's exposure to trade induces the more productive firms to enter the export market, while the less productive firms continue to produce for the domestic market. However, import competition also causes industries to contract, and this releases labour to the less productive sectors such as agriculture and the informal sector (McMillan and Rodrik, 2011).

- Financial Development
  - ***Domestic credit (DC)***: denotes the level of domestic credit provided by financial institutions to the private sector as a ratio of GDP. Financial development eases the financial constraints that firms are usually faced with (Levine, 2005). The improvement in credit access is usually associated with a more developed private sector, which serves as the engine of growth in the economy stemming from increased productivity and employment levels.

- Specialization in Primary Commodities

- ***Natural resource rents (NRR)***: signifies the difference between the price of commodities and what it costs to extract them, expressed as a ratio of GDP. Specialization in agriculture or primary commodities can prompt some sort of resource curse, whereby, labour concentrates in sectors with an existing comparative advantage over sectors with a higher possibility of scale economies and learning externalities like manufacturing (Morsy et al., 2014). However, when the income effects from natural resources are associated with industrialization, this gives rise to a consumption economy with the right mix of workers in the tradable and non-tradable sectors (Gollin et al., 2016).

- Labour Endowment
  - ***Population size (POP)***: is the total population size of a country. According to Todaro and Smith (2011), the role of population in the literature is largely ambiguous, but a more conventional argument is that of population growth as an essential factor for stimulating development. This is because larger populations can benefit from scale economies in production through an increased consumer demand, and as the population grows and occupies more land, the decline in arable land will also facilitate the movement of labour out of agriculture.

Descriptive statistics[10]

Table 4: Descriptive statistics

Variable		Description	Mean	Median	Max	Min	Standard deviation	Source
SC	Structural Change	Contribution of structural change to LPG	-0.0075	0.08305	6.7404	-18.0979	2.2227	WDI & GGDC 1992-2012
INV	Domestic investment	Share of investment in GDP	19.5783	19.3693	47.3819	2.7811	6.6937	WDI[a] 1992-2012
EDU	Education	Secondary school enrolment rate	33.3300	29.3986	91.8419	5.1323	20.5478	WDI 1992-2012
NRR	Natural resource rents	Share of natural resource	9.3083	6.764174	63.52083	0.0000	8.590246	WDI 1992-2012

[10] Descriptive statistics for each country are available in Appendix A.4.

		rents in GDP						
URB POP	Urban population	Percentage of urban population	29.5964	29.8060	57.7060	6.2880	12.5556	WDI 1992-2012
POP	Population size	Total size of population	18096167	10006767	168240403	907947.0	27970567	WDI 1992-2012
DC	Domestic credit	Domestic credit to private sector as a share of GDP	16.9933	13.1373	98.8475	1.61553	14.3923	WDI 1992-2012
FDI	Foreign direct investment	Ratio of foreign direct investment to GDP	2.9279	2.0530	36.9144	-6.8977	4.2200	WDI 1992-2012
TRADE	Trade openness	Sum of exports and imports as a share of GDP	67.4065	57.691	172.5312	11.4661	32.5950	WDI 1992-2012

a. Investment data for Lesotho is obtained from the Central Bank of Lesotho.

The structural change variable ranges between -18.1% and 6.74% within the observed period. The minimum level comes from Nigeria in 1994, although the country began experiencing positive levels from 1995 onwards. An interesting observation is that, only two countries; Tanzania and Senegal underwent a growth enhancing (positive) structural change for every year in the period. Furthermore, the maximum value of 6.74 was registered by Rwanda in 1995. Mozambique, (which also ranks second place on the structural change component in Table 3) recorded the highest share of investment in GDP with 47.38% in 2012, more than twice as much as the sample mean (19.58%). The lowest investment rates were recorded by Burundi, first in 2000 at 2.78%, followed by values below 4.5 in 2001 and 2002. Mauritius and Botswana (the lowest ranking countries from Table 3) attained the highest secondary school enrolment rates, and the two countries managed to score values above 70% between 1998 and 2012. Furthermore, the average number of the secondary school enrolment rate in our sample forms only 33.33% of the official secondary school age-group population.

When it comes to natural resource rents, Sudan was the lowest performer in the sample with values between 0 and 0.2 in the first decade. However, Sudan has since been showing signs of a ‘new resource-rich country’: receiving a share of over 12% of GDP from 2004. Surprisingly, Nigeria (which ranks in the top 4 on Table 4) received the

maximum share of 63.52% in 1993, and was followed by Burundi, Togo and Guinea, all of which rank in the bottom 11. On average, 29.6% of the sample population lives in urban areas, and although Rwanda was responsible for the minimum value (6.29) Burundi is the one with the least proportion of urban population (with an average of 8.77%) in the entire period. Furthermore, Nigeria has the largest size of total population (168,240,403 people in 2012) followed by Tanzania, while Swaziland was responsible for the minimum value (907,947 people in 1992). The share of domestic credit to the private sector was highest in Mauritius in 2012, accounting for 98.85% of GDP, while the smallest share came from Sudan in 1999. The ratio of FDI to GDP has a low average of 2.93% with a minimum of -6.9% by Botswana in 1993 and a maximum of 36.91% in Mozambique for the year 2012 followed by Lesotho at around 31% in 1996 and 1998. Once again, Sudan is the worst performer in terms of trade openness, followed by Burundi and Rwanda. The maximum value came from Swaziland and was followed by Lesotho (which both seem to be doing well despite being landlocked). The two managed to attain the highest share of total trade in GDP for almost the entire period.

Table 5: Correlation matrix

	INV	EDU	NRR	URB POP	POP	DC	FDI	TRADE
INV	1.000 -----							
EDU	0.3654 (0.000)***	1.000 -----						
NRR	-0.2770 (0.000)***	-0.3891 (0.000)***	1.000 -----					
URB POP	0.2542 (0.000)***	0.5588 (0.000)***	-0.244 (0.000)***	1.000 -----				
POP	-0.2497 (0.000)***	-0.1380 (0.0037)***	0.5202 (0.000)***	0.0359 (0.452)	1.000 -----			
DC	0.2399 (0.000)***	0.6867 (0.000)***	-0.2998 (0.000)***	0.2722 (0.000)***	-0.1223 (0.010)**	1.000 -----		
FDI	0.1439 (0.003)***	0.1389 (0.0035)***	0.0412 (0.3883)	0.1125 (0.018)**	0.0271 (0.571)	0.0696 (0.146)	1.000 -----	
TRADE	0.2413 (0.000)***	0.6248 (0.000)***	-0.3370 (0.000)***	0.2330 (0.000)***	-0.2600 (0.000)***	0.4845 (0.000)*** **	0.2781 (0.000) ***	1.000 -----

Notes: significance level at 1% (***) and 5% (**); p-value in parenthesis.

Table 5 shows the correlation matrix for all pairs of explanatory variables used for the analysis. There is a strong positive correlation between the secondary school

enrolment rate and the ratio of domestic credit provided to the private sector. There also exists a strong positive association between the enrolment rate and the ratio of total trade, with a correlation of 0.62. When the explanatory variables are strongly correlated, the regression analysis is likely to suffer from the problem of multicollinearity. In order to circumvent this problem, we avoid the combination of variables with a correlation coefficient ≥ 0.6.

5.3 Estimation results

We estimate two models (Model I and Model II) that correspond to different combinations of explanatory and control variables. Both models are estimated using time dummies in order to control for common macroeconomic shocks. We present specification and diagnostic tests in Table 6 and the estimation output in Table 7.

First, we carry out the Hausman test to determine the correct panel data model to use for our analysis. Next we use the Breusch-Pagan LM test to check for the presence of autocorrelation (and heteroscedasticity), and the results for both tests are provided on Table 6 below. According to the results, the Hausman test rejects the null hypothesis of no correlation between the effects and regressors for model I and fails to reject the null hypothesis in the case of model II. Thus, model I is estimated using fixed-effects while Model II uses random-effects. Furthermore, the null hypothesis of no cross-sectional dependence (and constant variance) is rejected by the Breush-Pagan test in both models. We therefore carry out the estimation using the Period SUR (from the E-views package), which corrects for both heteroscedasticity and the general correlation of observations within a given cross-section.

Table 6: Specification and diagnostic tests

	Model I	**Model II**
Hausman Test	18.34394 (0.0025)***	0.00000 (1.0000)
Breusch-Pagan LM Test	300.6486 (0.000)***	334.3143 (0.000)***

Notes: significance level at 1% (***); p-value in parenthesis.

Table 7: Determinants of the structural change magnitude (1992-2012)

Variable	Model I	Model II
Constant	-27.02516 (0.3778)	-10.83495 (0.0002)***
Investment	0.048114 (0.0339)**	0.004077 (0.8349)
Education	-0.028968 (0.2261)	--
Natural resource rents	-0.100486 (0.000)***	-0.067536 (0.0002)***
Urban population	-0.009745 (0.8365)	-0.030458 (0.0125)**
LOG (Population size)	1.774004 (0.3647)	0.743075 (0.000)***
Domestic credit	--	-0.020109 (0.0819)*
Foreign direct investment	--	-0.021459 (0.3878)
Trade openness	--	0.012506 (0.0496)**
Model Summary		
R-squared	0.285891	0.162212
Adjusted R-squared	0.204537	0.107442
F-statistic	3.514155	2.961664
Prob(F-statistic)	0.00000	0.00002
Durbin-Watson stat	2.146499	1.976669
Observations	441	441
Number of countries	21	21

Notes: (1) significance level at 1% (***), 5% (**) and 10% (*); p-value in parenthesis.
(2) the dependent variable is the structural component of labour productivity growth.

The regression results from Table 7 show that investment had a positive impact on structural change in SSA. This confirms that, physical capital has been channelled towards the growth of high productivity industries and was able to encourage the shift of labour from low productivity to high productivity sectors. As can be seen from Model I, a 1% increase in the ratio of physical capital accumulation is associated with an increase in the structural component by about 0.05%, *ceteris paribus*. However, Model II is only a little helpful in explaining this relation. Furthermore, results from Model I also suggest a negative relation between the enrolment in secondary education and structural change, although the associated coefficient is not statistically significant.

Both our model specifications provide strong evidence (significant at 1%) against the specialization of primary commodities. The results indicate a negative correlation between a country's dependence on natural resources and the rate at which structural change contributes to growth. This is consistent with the findings of McMillan et.al (2014) and could further suggest the possibility of a resource curse in the region. Furthermore, Model II shows a negative relationship between the structural change component and the rate of urbanization, while the total size of the population (in logarithmic terms) enters the model with a positive coefficient. Although the two variables are of minimal help in explaining structural changes for the Model I specification, the direction of the magnitude remains unchanged.

As indicated in Model II, the variable for financial development shows a significant and negative impact on the magnitude of structural change, where a 1% increase in the share of domestic credit leads to a 0.02% decline in the contribution of structural change to labour productivity growth. This could indicate a lack of incentives for the private sector to engage in the process of entrepreneurial discovery in high productivity sectors.

Model II shows a negative relationship between FDI and structural change. This relation is not at all surprising as a lot of studies have shown that the deindustrialization of developed countries has mostly been motivated by the access of cheap labour in developing countries of Africa and Asia (see for example Ozawa (2003) and Rodrik (2016)), thus leading to a shift in the production of labour intensive goods. However, this variable is not significant in our model. Coming to the role of globalization, the model provides support for the benefits of trade openness on growth, whereby, a 1% increase in the ratio of total trade increases the structural component by 0.01%. These results are consistent with the findings of McMillan and Rodrik (2011), Dabla-Norris et al. (2013) and McMillan et al. (2014), who find that, trade liberalization policies such as the exchange rate devaluation were instrumental in promoting a growth enhancing structural change.

Lastly, although our models only explain about 16% to 29% of the variation in the structural component (as indicated by the R-squared), the F-test rejects the null hypothesis that all coefficients are equal to zero, which provides evidence for the significance of our models.

Chapter 5. Conclusions

The high reliance of labour on the agricultural sector in low and lower middle income countries such as Lesotho indicates an untapped potential for structural change. The development literature has emphasised the role of structural change in accelerating the catch-up process and fostering sustainable economic development. Thus, our study contributes to the literature by identifying the key determinants of structural change in low to medium-low income per capita countries.

First, we begin by characterizing the process of development in Lesotho between 1990-2015. The reallocation processes suggest that production could be giving rise to tertiarization and informal sector activities in the economy, and this is further fuelled by the high rate of urbanization relative to the growth of the industrial sector. The high significance of agriculture in employment also implies the possibility of disguised unemployment (i.e., surplus labour) which in turn presents greater potential for structural change through the reallocation of labour. Furthermore, the high share of government expenditure in domestic demand suggests that private consumption within the economy is rather low. Nonetheless, the country currently exhibits a window of opportunity resulting from an increase in the number of potential producers relative to the number of dependents.

Secondly, the study conducts a static form of the shift-share analysis to explain the contribution of structural change on labour productivity growth in Lesotho between 1999 and 2008. The results of the analysis confirm the presence of a growth enhancing structural change, where labour is seen to be moving from agriculture to more productive industries within the economy. However, the analysis also uncovers a negative interaction between the reallocation of labour and the *within* sector productivity growth, which demonstrates a fall in the productivity growth of employment expanding industries. This could further indicate the incapacity of the modern sector to absorb the surplus labour from agriculture. However, this does not come as a surprise considering the low levels of investment within the economy.

Lastly, to perform an enquiry into the determinants of structural change, the study employs panel data regressions for a time series analysis involving 21 SSA countries over the period 1992-2012. Using a dynamic form of the shift-share methodology to compute

the dependent variable, we find that, urbanization and financial development have had a growth reducing impact on structural change, while the size of the population revealed to have a positive impact. We find a strong positive magnitude in relation to a change in investment, which further confirms the importance of capital accumulation in inducing the process of structural change. A positive effect resulting from trade openness is also revealed, indicating an imperative role for trade policies in assisting the reallocation of labour from low productivity to high productivity sectors. The analysis further exposes the debilitating effect suffered by countries with an endowment in natural resources, as indicated by a strong negative magnitude arising from an increase the share of natural resource rents.

For future research, it will be critical (although rather difficult because of the paucity of data) to enhance the explanatory capacity of our model by including variables that capture the effect of institutions on structural change. This can be done by including variables such as the labour market flexibility (e.g. Employment rigidity index), infrastructural development (e.g. Network index) and the business environment (e.g. Ease of doing business index). Furthermore, it is fundamentally important for future research to deliberate on how the structural component of labour productivity growth contributes to the welfare measures of development such as poverty and human development, as this is particularly vital in order to ascertain that growth occurs in an inclusive manner.

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Appendices

Appendix A.1: GDP and GDP per capita in 1960 and in 2015 (in current US$) in selected SSA countries

		GDP *(million)*		GDP per capita *(million)*		
	Country	**1960**	**2015**	**1960**	**2015**	**Average growth rate**
	Lesotho	34.58	2,278.04	40.60	1,067.00	0.06
	Burundi	196.00	3,097.32	70.30	277.10	0.02
	Rwanda	119.00	8,095.98	40.60	697.30	0.05
	Swaziland	35.08	4,118.49	100.40	3,200.10	0.06
BORDERING COUNTRIES						
		GDP *(million)*		GDP per capita *(million)*		
Country	**Bordering Countries**	**1960**	**2015**	**1960**	**2015**	**Average growth rate**
Lesotho	**South Africa**	7,363.10	314,571.95	423.30	5,724.00	0.05
Burundi	**DRC**	-	35,237.74	-	456.10	
	Rwanda	119.00	8,095.98	40.60	697.30	0.05
	Tanzania	-	45,628.25	-	879.00	
Rwanda	**Burundi**	196.00	3,097.32	70.30	277.10	0.02
	DRC	-	35,237.74	-	456.10	
	Tanzania	-	45,628.25	-	879.00	
	Uganda	423.01	27,529.25	62.30	705.30	0.04
Swaziland	**Mozambique**	-	14,807.08	-	529.20	
	South Africa	7,363.10	314,571.95	423.30	5,724.00	0.05

Source: Own computations with data from the *World Development Indicators* (http://data.worldbank.org. Accessed on 15.01.2017)

Appendix A.2: Structural change and economic development in Africa: an overview of the literature

Reference	Research question	Sample	Research Method	Variables	Results
Aksan A. (2014)	What is the effect of childhood mortality and morbidity on demographic transition?	30 SSA countries from 1992-2008.	Poisson model (Nonlinear regression)	Dependent Variable: - Number of children born to an individual in the past 5yrs. Explanatory variables: - Child mortality in a community 5yrs ago - (Squared) Child mortality in a community 5yrs ago - Current childhood morbidity in a community (women's current perceptions that their children will be healthy upon reaching school age, proxied by child stunting; A child is considered stunted if he falls two standard deviations below the reference median height of the US Centers for Disease Control and Prevention) - Current childhood morbidity in a community x Childhood mortality in a community 5yrs ago - Vector of individual level control variables for factors affecting fertility decisions: Number of deceased children up until 5yrs ago, number of births until 5yrs, primary education, births in past 5yrs, age, use of electricity in home, car ownership, region, number of siblings, stunted in childhood - Vector of community level control variables: stunting prevalence, mortality until 5yrs ago, primary education, number of households per cluster.	- Results exhibit a positive relation between child mortality and fertility rates. - The problem of morbidity has become the primary challenge as health interventions continue to reduce child deaths.
de Brauw et al.. (2014)	What is the contribution of migration to urban growth in sub-Saharan Africa?	SSA for the period 1990-2000.	Demographic equation	-Urban population growth (which is the sum of the following components) - Net fertility (the birth rate less the death rate) - Urban expansion or reclassification of areas from rural to urban - Rural–urban migration - International immigration.	- There was a 3.4% average urban growth rate in sub-Saharan Africa between 1990 and 2000, while the population weighted rural–urban migration rate was 1.07% per annum. - Negative rural-urban migration rates have also been observed in the region, presenting evidence for re-ruralization.

Carmignani and Mandeville (2014)	What is the impact of structural change on the macroeconomic dynamics of Africa?	49 African countries, 1960-2008.	Growth regression model (with three similar regressions for each measure of structural change.)	Dependent Variable: -Annual rate of per capita GDP growth Explanatory Variables: - A measure of structural change (correlation between changes in the share of agriculture and changes in the shares of other sectors in each country: Services correlation, Industry correlation, Manufacturing correlation) - Vector of potential determinants of long term growth (Population density, value of oil reserves in 1970 as a measure of resource abundance, four dummy variables for soil quality; deserts, steppes, desert dry winter, and dry steppe wasteland, dummy variable for origin of the legal system, Herfindhal index, log(GDP per capita), distance from equator)	- A shift from agriculture to non-manufacturing industry accompanied by specialization. - A negative impact of non-manufacturing industry on growth.
Christiaensen and Todo (2014)	What is the role of urban transformation in development?	51 developing countries across five continents, (of which 14 are from SSA) from 1980–2004.	Fixed-effects panel estimation.	Dependent Variable: - Change rate of rates of $1 and $2 per day poverty headcount ratios Explanatory Variables: - Change rate of the population in the missing middle (i.e., rural nonfarm or secondary towns) - Change rate of the population in metropolitan areas - Growth rate of GDP per capita - Number of floods - Dummy variables for specific country effects and year specific global effects	- Migration from agriculture to rural nonfarm is substantially associated with the reduction of poverty while no statistically significant effect was found in the migration to mega cities. - Migration to mega cities yields faster growth although with higher income inequality.
Dabla-Norris et al. (2013)	What are the determinants of structural transformation across the world?	168 countries (with 23 African countries included in the regression) from 1970-2010.	Pooled OLS and quantile regressions	Dependent variables: - Real value added share of agriculture - Real value added share of manufacturing - Real value added share of services Explanatory Variables: • Specific country fundamentals - Mining, % of total value added - Land Area in sq km (log) - Total population (log) - Arable land, % of total land area - Age dependency ratio - Young (% of working age population) - Age dependency ratio - Old	- Country fundamentals such as natural endowments, population and age dependency ratios explain about 70% of the variation in the shares of agric. and services around the world. - Dependency ratios are strongly and negatively related with agriculture and manufacturing, but positive and significant for services, while population is negatively related with agric. and has a positive effect on manufacturing

				- GDPPC (log) - Square of GDPPC (log) - Dummy variable for transitioning economies - Dummy variable for island economies with < 1mill. population • Policy variables - Trade openness (sum of exports and imports as % of GDP) - Financial development (domestic credit to private banks and other financial institutions as % of GDP - FDI as % of GDP - Total enrolment in tertiary education as % of the 5yr age group following on from secondary school - Agriculture index (to capture intervention in the market for the main agricultural export commodity in each country) - Network index (to capture electricity and telecommunication indicators - Financial reform index (as an index for financial liberalization) - Capital account openness index - Labour regulation index (as a proxy for labour market flexibility) - Real capital stock (log) - Trade liberalization index - Economic globalization index - Real effective exchange rate	- Financial depth and the enrollment in tertiary education have a positive impact on services but are non-significant for manufacturing. Also, Trade liberalization is positively related to manufacturing and negatively related to agriculture, while FDI has positively affected agriculture but non-significant for the other two.
Marouani and Mouelhi (2016)	How has structural change contributed to productivity levels in Tunisia?	Tunisia, 1983-2008 (for the sectoral analysis). 1997-2002 (for the firm level analysis of structural change in the manufacturing sector).	Shift-share analysis suggested by McMillan and Rodrik (2011) for the decomposition of productivity growth. to calculate the within and the between components. A regression analysis for the determinants of structural change.	Productivity decomposition: - Labour Productivity per Sector (disaggregated into nine sectors) - Share of Employment by sector Regression analysis: Dependent Variable: - Structural Change (between sector component from the decomposition equation) Explanatory Variables: - Physical Capital Accumulation (ratio of investment to GDP) - Human Capital Accumulation (ratio of tertiary enrolments to the total population of the five-year age group following on from secondary school leaving) - Trade Openness (percentage of imports) - Foreign Direct Investment (percentage of GDP) - Financial Development (ratio of domestic Credit) - Dummy (for FTA with the EU) Cobb-Douglas regression Dependent Variable:	- Productivity growth in Tunisia has been high between 1983-2008, dividing the period into two shows that it more than doubled in the period after 1995 due to the within sector component of productivity. - Structural change has been low and was negatively affected by investment and policies from the 1990's, although trade reforms have had a positive impact.

			Firm-specific production function described by a Cobb-Douglas equation.	- Log Output Explanatory Variables: - Log Capital Input - Log Labour Input	
McMillan et al. (2014)	What are the patterns that describe structural change in Africa, Asia and Latin America?	38 countries of which 8 are African, 1990-2005.	Shift-share analysis for the decomposition of productivity growth. Regression analysis for the determinants of the structural change magnitude.	Productivity decomposition: - Labour Productivity per Sector (disaggregated into nine sectors) - Share of Employment by sector Regression analysis: Dependent Variable: - Structural Change (between sector component from the decomposition equation) Explanatory Variables: - Initial level of structural change (agricultural share in employment at beginning of period) - Comparative advantage in primary products (raw materials' share in exports) - Trade liberalization (undervaluation index) - Labour market flexibility (Employment rigidity index (0–1)) - Regional dummies	- Structural change has been growth enhancing in Asia but growth reducing in Africa and Latin America in the period 1990-2005. - Dividing the study period in to two shows that structural change in Africa has been growth enhancing in the post 2000 period. This was mainly driven by the expansion of the manufacturing sector and contraction of agriculture and services. - Countries with a comparative advantage are at risk of stunting their process of structural change, and the risk is exaggerated by macroeconomic factors such as currency overvaluation and employment rigidity.
Mengistu (2009)	Do physical and human capital matter for export diversification?	41 countries from SSA and East Asia, 1975-2004.	Feasible General Least Squares (FGLS) technique.	Dependent Variable: -Export Diversification (measured as the ratio of vertical diversification (i.e., the share of manufactured exports to total exports) to horizontal diversification (i.e., the number of export sectors classified by the Standard International Trade Classification)). Explanatory Variables: - Domestic Capital (% GDP) - Foreign Direct Investment (% GDP) - Human Capital (Secondary School Enrolment Ratio to total population with age 15 and above.)	- Domestic capital and human capital have a positive impact on export diversification in East Asia and SSA. - FDI is positive and significant on horizontal diversification in both regions but positive and significant on vertical export diversification in East Asia only.

				- Level of Development (GDP per capita) - Labour Force (Size of population) - Quality of Infrastructure (Number of fixed and mobile telephone per 1000 people) - Degree of Openness - Inflation (the rate of change of the GDP deflator) - Life Expectancy - Natural Resource Endowment (proxied by oil dummies) - Aid per capita (Official Development Assistance per capita) - Exchange Rate (US$) - Political Instability (war dummies) - Regional Dummy	- Evidence from East Asia indicate strong spill over effects of vertical diversification on the economy, thus SSA needs to make a gradual shift from horizontal to vertical diversification in exports.
Morsy et.al (2014)	What is the extent of structural change in Egypt?	Egypt 2000-2019 (for explaining the structural transformation) 22 countries including 6 from SSA from1990-2010 (for the determinants of structural change)	Shift-share analysis for the decomposition of productivity growth. Regression analysis for the determinants of structural change.	Productivity decomposition: - Labour Productivity per Sector (disaggregated into nine sectors) - Share of Employment by sector Regression analysis: Dependent Variable: - Structural Change (between sector component from the decomposition equation) Explanatory Variables: - Initial share of agriculture in employment - Share of primary commodities in exports - Change in trade openness - Change in financial openness (the sum of the foreign assets and liabilities of a country divided by its GDP) - Growth in domestic credit to private sector - Initial level of credit to GDP - Change in capital intensity - Initial level of capital accumulation per worker - Change in education (average years of schooling of the working age population) - Dummies for high income, African and Asian countries	- Structural change was flat and negative even during periods of high growth due to the high concentration of labour in agriculture and other activities with relatively low productivity. - Higher trade openness, domestic credit to private sector and surplus labour in agriculture increases the potential for structural change, while the specialization in primary commodities negatively affects the process of structural transformation. - Other factors such as years of schooling and capital intensity did not have a significant impact.

de Souza (2015)	What macroeconomic mechanisms explain the observed complementarity between agricultural and industrial development?	62 developing countries including 24 from SSA, 1960-2006.	Random-effects model (adapted for the use of Instrumental variables i.e., Housman-Taylor estimation method).	Dependent Variable: - GDP per capita growth per 5yr period Explanatory Variables: (All measured at the beginning of each 5yr period) - Share of manufacturing in GDP ("MAN") - Share of Services in GDP - Stage of development (indexed by GDP per capita relative to the US – "RELUS") - Absorptive Capacity (indexed by human capital "EDU") - Log Population Size - Dummy for Climate Zone - Dummy for Openness - Time intercept Dummies for the eleven 5yr time periods (Interaction terms) - MAN x RELUS (to capture the idea that the potential of a technology gap is largest at low levels of development) - x MAN x EDU (to capture the effect of absorptive capability)	- Growth of the agricultural sector has a strong positive effect on industrial growth. - Agriculture growth also benefits the manufacturing sector through an improved terms of trade, increasing the share of investment and saving in GDP, and by improving the capability to import industrial inputs.
Szirmai and Verspagen (2015)	What is the role of manufacturing in economic growth and development?	67 developing and 21 developed countries, 1950-2005.	Random-effects model (Adapted for the use of Instrumental variables i.e., Housman-Taylor estimation method).	Dependent Variable: - GDP per capita growth per 5yr period Explanatory Variables: (All measured at the beginning of each 5yr period) - Share of manufacturing in GDP ("MAN") - Share of Services in GDP - Stage of development (indexed by GDP per capita relative to the US – "RELUS") - Absorptive Capacity (indexed by human capital "EDU") - Log Population Size - Dummy for Climate Zone - Dummy for Openness - Time intercept Dummies for the eleven 5yr time periods (Interaction terms) - MAN x RELUS (to capture the idea that the potential of a technology gap is largest at low levels of development) - MAN x EDU (to capture the effect of absorptive capability)	- There is a positive effect of manufacturing on growth in the whole sample, meaning that manufacturing acts as an engine of growth in both developed and developing nations. - The interaction variables show that manufacturing is a more effective strategy at lower levels of development. - Manufacturing has become less effective since the 1990s due to the greater amounts of human capital that it now requires to achieve the same effects on growth as before.

Appendix A.3: Data sources

Indicators	Source	Website	Access Date
Gross Domestic Investment (% of GDP)	Central Bank of Lesotho	http://www.centralbank.org.ls	23/03/2017
Net Foreign Direct Investment (% of GDP)	World Development Indicators	http://data.worldbank.org	04/02/2017
Government Revenue (% of GDP)	International Monetary Fund	http://www.imf.org	28/02/2017
Gross Enrolment Ratio – Secondary	World Development Indicators	http://data.worldbank.org	04/02/2017
Government Expenditure (% of GDP)	International Monetary Fund	http://www.imf.org	28/02/2017
Agriculture, Industry, Services Output (% of GDP)	World Development Indicators	http://data.worldbank.org	04/02/2017
Merchandise Exports (% of GDP)	Central Bank of Lesotho	http://www.centralbank.org.ls	23/03/2017
Diamond Exports (% of GDP)	Central Bank of Lesotho	http://www.centralbank.org.ls	23/03/2017
Textile Exports (% of GDP)	Central Bank of Lesotho	http://www.centralbank.org.ls	23/03/2017
Agriculture, Industry, Services Employment	World Development Indicators	http://data.worldbank.org	04/02/2017
Urbanization (% of total population)	World Development Indicators	http://data.worldbank.org	04/02/2017
Crude Birth and Death Rates (per 1000 people)	World Development Indicators	http://data.worldbank.org	21/03/2017
Age Dependency Ratio (% of working-age population)	World Development Indicators	http://data.worldbank.org	09/02/2017

Appendix A.4: Descriptive statistics per country

Country	Stats	SC	INV	EDU	FDI	TRADE	DC	URB POP	POP	NRR
Botswana	Mean	-2.65	31.00	72.62	2.56	93.59	18.86	53.02	1789899.95	3.11
	Min	-7.75	23.44	47.45	-6.90	85.83	9.69	46.44	1460453.00	0.42
	Max	0.38	41.41	86.88	8.74	108.65	31.25	56.70	2132822.00	11.45
	Std. dev	2.40	5.33	12.14	3.25	6.95	6.44	3.25	195952.42	3.18
Burkina Faso	Mean	-0.47	23.19	13.51	0.66	38.49	12.21	19.79	12537798.86	10.25
	Min	-2.80	13.79	7.48	0.08	28.37	6.79	14.33	9297116.00	5.21
	Max	1.22	32.45	25.94	2.95	62.68	18.11	27.35	16590813.00	19.00
	Std. dev	1.03	4.14	5.61	0.64	8.65	3.33	4.26	2262440.16	4.11
Burundi	Mean	-0.66	14.11	12.72	0.12	35.76	15.49	8.77	7529350.62	24.06
	Min	-2.74	2.78	6.16	0.00	20.96	10.72	6.64	5895131.00	14.02
	Max	0.17	30.52	27.90	1.34	54.15	20.31	11.19	10124572.00	40.55
	Std. dev	0.90	9.60	6.39	0.29	10.96	2.55	1.41	1334386.63	7.23
Cameroon	Mean	-0.37	16.92	30.85	1.24	41.52	9.87	46.75	16945300.62	9.02
	Min	-3.23	12.57	23.17	-0.15	31.75	6.54	40.82	12796739.00	6.44
	Max	1.87	20.59	50.47	4.62	52.34	14.18	52.68	21659488.00	12.63
	Std. dev	1.36	2.50	7.92	1.29	4.33	2.10	3.70	2736270.51	2.06
Gambia	Mean	-0.43	16.17	39.68	4.80	60.28	9.39	49.51	1340627.71	3.76
	Min	-1.79	4.56	18.30	0.89	46.93	3.73	40.52	979701.00	2.00
	Max	0.61	33.06	58.83	12.55	74.92	16.22	57.71	1807108.00	6.30
	Std. dev	0.66	10.88	14.79	3.36	8.09	4.16	5.38	256833.50	1.43
Guinea	Mean	-0.41	18.26	22.91	3.20	58.87	4.88	31.88	9206833.76	18.66
	Min	-2.63	10.57	12.10	0.00	42.42	3.61	28.60	6751394.00	10.76
	Max	0.77	21.70	37.64	18.87	91.69	9.13	35.75	11628767.00	29.10
	Std. dev	0.78	3.38	10.03	4.84	13.76	1.39	2.21	1356924.12	6.27
Kenya	Mean	0.27	18.21	44.00	0.54	57.49	24.86	20.69	33140982.33	4.33
	Min	-9.32	15.00	23.18	0.04	48.19	18.50	17.34	25029754.00	2.95
	Max	4.89	21.82	67.64	2.53	72.86	30.57	24.37	42542978.00	7.29
	Std. dev	4.02	2.22	13.49	0.66	7.06	2.88	2.18	5346506.16	1.28
Lesotho	Mean	-0.07	17.98	37.52	8.15	129.99	13.33	20.59	1875441.00	3.97
	Min	-0.86	13.52	26.35	0.32	113.72	5.26	15.11	1660360.00	2.45
	Max	1.20	21.70	53.28	30.39	151.20	22.02	25.76	2057331.00	5.50

Country	Stats	SC	INV	EDU	FDI	TRADE	DC	URB POP	POP	NRR
	Std. dev	0.62	2.31	7.92	10.66	10.40	4.82	3.28	111789.49	0.84
Malawi	Mean	0.98	16.97	28.33	1.86	60.20	8.63	14.50	12043026.05	8.90
	Min	-1.41	11.60	16.09	-0.39	41.90	4.13	12.22	9682918.00	5.71
	Max	3.54	29.10	36.02	10.18	91.38	14.69	15.80	15700436.00	18.25
	Std. dev	1.20	5.06	5.38	2.29	11.50	3.58	1.04	1960289.65	3.06
Mali	Mean	-0.20	20.23	22.05	2.23	55.37	13.13	30.19	12037822.14	7.37
	Min	-2.39	15.46	8.23	-0.77	46.25	7.52	24.19	8891141.00	3.00
	Max	3.78	24.24	40.68	6.35	63.79	17.54	37.58	16112333.00	16.62
	Std. dev	1.30	2.45	11.07	1.92	4.35	2.31	4.28	2254307.89	3.73
Mauritius	Mean	-1.18	25.67	78.48	1.85	121.28	64.26	42.10	1190921.71	0.01
	Min	-3.10	20.70	58.21	-0.61	104.43	37.72	40.16	1084441.00	0.00
	Max	0.05	31.78	91.84	5.80	132.20	98.85	43.65	1255882.00	0.03
	Std. dev	0.63	2.76	11.19	1.86	7.29	17.22	1.11	55646.42	0.01
Mozambique	Mean	1.36	24.05	12.13	6.94	67.90	13.56	29.23	19639360.43	11.08
	Min	-11.32	14.69	5.13	1.10	41.13	7.89	25.98	14203987.00	6.69
	Max	6.28	47.38	24.88	36.91	110.83	24.52	31.42	25732928.00	22.41
	Std. dev	3.73	8.08	7.13	9.05	15.81	5.32	1.54	3501341.22	3.80
Namibia	Mean	-1.07	21.18	60.43	4.80	96.77	43.51	34.81	1923404.95	1.71
	Min	-11.04	15.44	48.45	0.04	80.76	31.35	28.34	1513689.00	0.37
	Max	3.35	27.83	65.21	10.70	125.48	50.76	43.67	2291645.00	6.08
	Std. dev	3.10	3.31	5.19	2.77	11.45	4.91	4.84	226809.34	1.33
Nigeria	Mean	0.97	9.85	30.90	3.82	60.21	15.69	37.12	131158823.48	30.23
	Min	-18.10	5.47	23.42	1.55	42.31	9.01	30.68	100592458.00	13.79
	Max	4.40	17.29	46.76	10.83	81.81	38.39	45.23	168240403.00	63.52
	Std. dev	4.65	3.38	7.75	2.19	10.94	7.52	4.63	20884193.23	11.55
Rwanda	Mean	0.70	16.82	17.74	0.74	36.41	10.88	16.52	8272681.95	8.37
	Min	-5.07	9.98	9.33	0.00	23.83	5.68	6.29	5912755.00	4.95
	Max	6.74	25.89	38.39	2.24	71.10	18.75	25.89	10817350.00	16.24
	Std. dev	2.22	4.54	8.79	0.81	9.76	3.16	5.89	1604160.17	2.88
Senegal	Mean	0.54	19.70	21.83	1.84	66.09	20.06	40.76	10579823.00	3.51
	Min	0.11	10.02	14.48	-0.01	49.64	14.69	39.19	7990736.00	2.22
	Max	1.27	31.22	40.07	3.77	78.62	29.32	42.78	13780108.00	6.35

Country	Stats	SC	INV	EDU	FDI	TRADE	DC	URB POP	POP	NRR
	Std. dev	0.46	6.39	8.78	1.07	6.84	4.97	1.07	1755594.67	1.03
Sudan	Mean	-0.01	22.12	34.20	3.11	29.30	6.56	32.57	29804439.57	8.51
	Min	-2.33	12.47	28.26	0.00	11.47	1.62	31.10	21820588.00	0.00
	Max	1.77	29.32	41.18	7.65	47.58	13.96	33.32	37712420.00	21.76
	Std. dev	0.90	5.07	3.95	2.25	10.90	4.52	0.47	4802303.14	7.54
Swaziland	Mean	0.23	19.14	48.77	3.09	136.16	16.31	22.35	1073124.29	3.32
	Min	-0.71	13.88	41.41	-2.77	98.96	8.91	21.37	907947.00	2.08
	Max	0.59	26.49	60.67	9.68	172.53	21.88	23.08	1231694.00	4.62
	Std. dev	0.31	3.42	5.88	2.97	19.83	3.82	0.62	93704.52	0.87
Tanzania	Mean	1.38	23.13	16.71	3.24	47.34	8.40	23.75	36707974.62	7.99
	Min	0.21	14.90	5.22	0.26	33.49	3.09	19.54	27203865.00	4.39
	Max	3.63	33.24	34.24	5.77	65.69	13.00	29.49	48645709.00	14.04
	Std. dev	1.45	5.68	10.32	1.66	9.85	3.33	3.10	6492425.45	2.55
Togo	Mean	-0.02	16.16	36.64	3.33	83.69	18.71	33.86	5224472.29	11.50
	Min	-3.07	7.48	19.93	-0.96	56.48	8.63	29.43	3984356.00	6.13
	Max	2.95	24.19	54.71	19.38	107.18	30.30	38.49	6745581.00	31.11
	Std. dev	1.22	3.02	12.22	4.03	14.29	6.07	2.82	860562.13	6.47